

THE MINERAL INDUSTRY OF JAPAN

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Japan is located in East Asia between the North Pacific Ocean and the Sea of Japan (East Sea), east of the Korean Peninsula. The country's land area is 374,744 square kilometers, and its population was about 127.3 million in 2003. Japan is a high-income developed country. Its economy ranked the second leading in the world with a gross domestic product (GDP) of \$4.3 trillion; its per capita GDP was \$33,719 in 2003. Its GDP and per capita GDP based on purchasing power parity, however, were estimated to be \$3.5 trillion and \$27,574, respectively, in 2003 (International Monetary Fund, 2004[§];¹ World Bank Group, 2004a, b[§]).

Japan was one of the most industrialized and technologically advanced countries in the world despite its limited indigenous natural resources. Japan relied heavily on imports of mineral fuels and a wide variety of nonfuel minerals and mineral products to meet the raw material requirements for its large manufacturing and utility (electricity and gas) sectors. Japan, however, has substantial indigenous resources of industrial minerals, such as dolomite, iodine, limestone, pyrophyllite, and silica (table 3).

Japan's production capacities of the chemical, construction material, electricity, and ferrous and nonferrous metals industries in the manufacturing and utility sectors were among the leading in the world. These industries processed imported raw materials and produced a broad category of mineral products, which included chemical compounds, construction materials, ferrous metals, fertilizer materials, industrial minerals, inorganic chemicals, nonferrous metals, petrochemicals, and refined petroleum products, for domestic consumption by the downstream industries in the manufacturing and construction sectors and for export to the world markets. The electricity and gas industries used imported coal, natural gas, petroleum, and uranium and other nuclear fuel materials to produce electricity and processed natural gas to meet the energy requirements for the construction, manufacturing, mining, and other sectors of the economy.

In 2003, Japan was one of the world's top importers and consumers of primary aluminum, cadmium metal, coal, cobalt metal, copper ore and metal, diamond, ferrochromium, ferronickel, fluorspar, gallium metal, gold metal, iron ore, ilmenite and rutile, indium metal, lead ore and metal, lithium metal, manganese ore and metal, magnesium, liquefied natural gas (LNG), nickel ore and metal, crude petroleum, platinum-group metals, phosphate rock, potash, rare earths, industrial salt, silicon metal, silver metal, tin metal, tungsten ore, zinc ore and metal, and zircon. Japan was one of the world's major exporters of cement, refined copper, inorganic chemicals, compound fertilizers, iodine, electrolytic manganese dioxide, high-purity rare (minor) metals, iron and steel, and titanium sponge and titanium products.

The mining sector was the smallest sector of Japan's industry-based economy. According to the Government statistics on GDP at constant prices classified by economic activities of Japan's national accounts, the percentage contribution of the mining sector to Japan's GDP was only 0.2%. The percentage contribution to Japan's GDP by the mineral industry, which included the mining (0.2%) and mineral processing of ferrous and nonferrous metals (1.4%), chemicals (1.9%), fabricated metal products (1.0%), petroleum and coal products (1.1%), and industrial mineral products (0.7%) industries, however, was 6.3% (Economic and Social Research Institute, 2004b[§]).

The mineral industry was important to the Japanese economy because of its sizable contribution to the GDP and the vital role it played in supplying primary materials not only to its own construction and manufacturing sectors, but also to those sectors of China, the Republic of Korea, and Taiwan in Northeastern Asia and to such members of the Association of Southeast Asia Nations (ASEAN) as Brunei, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam in Southeastern Asia.

The Japanese economy, as measured by real GDP in 1995 constant prices, continued a positive growth of 3.2% in fiscal year 2003 (from April 2003 to March 2004) following a positive growth of 1.1% (revised) in fiscal year 2002 (from April 2002 to March 2003). Japan's real GDP (in 1995 constant prices) rebounded to a positive growth of 2.4% in calendar year 2003 following a negative growth of 0.3% (revised) in calendar year 2002. The higher growth in 2003 was largely owing to the substantial increase in private demand especially in private plant and equipment investment and increase in exports of goods and services. Japan's real GDP was estimated to be \$4.7 trillion in 2003 (Economic and Social Research Institute, 2004a[§]).

In 2003, Japan's industrial production, as measured by the indices of mining and manufacturing, increased by 3.3%. The number of unemployed workers in Japan decreased to 3.50 million from 3.59 million (revised) in 2002, and the total labor force decreased to 66.66 million from 66.69 million in 2002. As a result, the unemployment rate in Japan dropped slightly to 5.3% from a record high of 5.4% in 2002. Japan's merchandise trade surplus rose to \$87.9 billion from \$78.9 billion in 2002. As a result, the Japanese yen appreciated by 8.2% to ¥115.94 against \$1.00 in 2003. As measured by the consumer price index, Japan's rate of deflation decreased to 0.3% from 0.9% in 2002 (Japan Institute for Labor Policy and Training, 2004[§]).

Government Policies and Programs

Because of its limited indigenous mineral resources, to secure stable and efficient supply of mineral resources by promoting exploration and development of minerals overseas and to encourage domestic metals recycling were Japan's two major mid- to long-term mineral resources policies.

¹References that include a section mark (§) are found in the Internet References Cited section.

In fiscal year 2003, government budgets related to the mining industry, which totaled about \$750 million, were reduced by 5.9% from those of fiscal year 2002. Major cuts in fiscal year 2003 included those to the ocean resources efficient utilization research program by 41.9% to \$20 million, aid for the exploration and development of domestic mine program by 36.8% to \$38 million, the rare metal stockpile program by 23.7% to \$96 million, and resources exploration technology cooperation under the Official Development Assistance Program (ODA) by 8.3% to \$171 million. However, the budgets for the mineral-resource-related technology development program and operation of the Metal Mining Agency of Japan (MMAJ) were raised by 22.6% to \$55 million and 17.8% to \$118 million, respectively (Agency for Natural Resources and Energy, 2003§).

The MMAJ in cooperation with the Japan International Cooperation Agency (JICA) continued to undertake overseas mineral exploration projects as part of the ODA in 2003. In response to requests from the governments of developing countries, the MMAJ provided technical assistance, which included the transfer of advanced exploration technology to these governments, and carried out a broad range of basic exploration programs to further exploration and development of their mineral resources. The MMAJ also provided financial aid (in the form of low-interest-bearing loans) as well as exploration assistance and technical support, which included geologic and geophysical surveys and drilling, to private Japanese companies and their foreign partners that were involved in joint-exploration works outside of Japan in 2003.

To assist and accelerate mineral production through effective mineral exploration with nongovernmental organizations in developing countries, the MMAJ started a new mineral exploration program, which was called the Joint Basic Exploration Scheme (JBES), with a budget of \$5 million for fiscal year 2003. The annual budget was expected to increase gradually to \$15 million by fiscal year 2005.

The target commodities of the JBES, in the order of priority, were copper, zinc, nickel, platinum-group metals, and rare metals, which included cobalt, chromium, manganese, rare earths, tantalum, titanium, and tungsten. The potential joint-venture partners of the JBES included such organizations as state-owned mineral enterprises, regional government organizations, local geological survey agencies, and private companies that held an exploration license and had the power to sign and carry out the JBES. A typical JBES agreement would include minimum work and expenditure commitment and farm-in arrangements with projects that would last 1 to 5 years. After completing the first-round survey program, the MMAJ would have the right to transfer, through a bidding system, its exploration interests to Japanese companies. If a suitable Japanese company could not be found, the MMAJ could return its interest to the joint-venture partner (Metal Mining Agency of Japan, 2003§).

In 2003, the MMAJ's ongoing ODA projects included seven mineral exploration projects, a deep ocean mineral exploration project, and an environmental survey project. The seven ongoing mineral exploration projects were to explore for copper and gold in porphyry copper and vein-type deposits in the East Java area of Indonesia; gold in greenstone-type deposits in the Baoule-Banifing area of Mali; gold, lead, silver, and zinc in massive sulfide deposits in the Zacualpan area of Mexico; copper, gold, and molybdenum in porphyry copper and vein-type deposits in the Western Erdenet area of Mongolia; copper and zinc in massive sulfide deposits in the Marrakech-Tekna area of Morocco; and copper, lead, and zinc in Kuroko-type deposits in the Yani-Pelecuchio area of the La Paz region in Bolivia and in the Hopa area in northeastern Turkey. The ongoing deep ocean mineral exploration project was to explore for cobalt, gold, lead, nickel, silver, zinc, and other minerals in selected areas within the exclusive economic zones in the federated states of Kiribati and Niue. The ongoing environmental survey project was to conduct a geochemical baseline study that involved analyses of river water quality, stream sediments, and other analyses in the Viti Levu South region of Fiji (Metal Mining Agency of Japan, 2004, p. 27-29).

Environmental Issues

Japan's first law to regulate soil contamination in urban areas, the Soil Contamination Countermeasures Law, took effect on February 15, 2003. To solve the problem of soil contamination caused by hazardous substances and to prevent human health from being damaged by the contamination, companies that handle chemicals would be required to comply with the new law. Under the law, when the condition of the soil ceases to be monitored because of a plant closure or when a Prefecture Governor judges that human health may be negatively affected, the landowners are required to investigate the land for soil contamination. If soil contamination exceeds a certain level, the Prefecture Governor must designate the contaminated land as a polluted site and disclose the information to the public by recording the change in the land registry. If there is a risk to human health, the Prefecture Governor is to order the polluter or the landowner to clean up or cover the contaminated soil site. To ensure credibility in the examination of soil contamination, the Environment Minister designates technically capable investigators as certified bodies (Japan for Sustainability, 2003§).

After the Japanese Government enacted the Designated Household Appliance Law (the Home Appliance Recycling Law) in April 2001, illegal dumping at the sides of roads, in rivers, on mountainsides, and in the ocean increased. People reportedly had been arrested by police for trying to dump such discarded appliances as air conditioners, refrigerators, televisions, and washing machines near train stations. About 18 million to 20 million appliances were junked every year in Japan; only about 9 million units, however, had been collected and sent to 37 recycling centers in 2003. To handle its own products as demanded by the Government under the Home Appliance Recycling Law, Matsushita Electric Industrial Co. Ltd., which was one of Japan's leading producers of consumer electronics and electric products, established the Matsushita Eco-Technology Center (Metech) in 2001 and built a \$43-million advanced recycling plant with four disassembly lines in Yashiro, Hyogo Prefecture, in western Japan. Metech's plant reportedly handled more than half a million units of discarded household appliances in its first year of operations and gradually increased to one

million units and achieved a 10% to 15% increase above the 50% to 60% recycling rate required by law in 2003 (Lai, 2003§; Lytle, 2003§).

Production

Mine production of all nonferrous metals (except zinc) and most industrial minerals (except dolomite and kaolin) declined in 2003 because of depleting ore reserves. Mine production of zinc increased because of higher ore production from the Toyoha Mine in Hokkaido Prefecture. Limestone production declined because of lower consumption as aggregate for cement and for concrete. Japan's coal output was estimated to have remained at about the same level as that of 2002. In 2003, 11 small-scale open pit coal mines and 1 underground coal mine still operated in the Prefectures of Hokkaido and Yamaguchi. The output of crude petroleum and natural gas increased in 2003 but remained very small.

In the mineral processing industry, production of most nonferrous metals, such as refined copper, gold, lead, nickel, tin, titanium, and zinc, increased owing to the stronger demand for metals in the domestic and overseas markets in 2003. Production of ferrochromium decreased sharply in 2003 because of a plant closure by Shunan Denko in Yamaguchi Prefecture and a plant idled by NKK Materials Co. Ltd. in Toyama Prefecture. Production of iron and steel increased to the highest level in 14 years owing mainly to the stronger domestic demand by the automobiles, machinery and equipment, and shipbuilding industries and the continued high level of exports. Production of titanium sponge metal increased owing to strong domestic demand despite a decrease in exports of titanium sponge. Production of cement and other construction-related materials was lower because of the downturn in the construction sector in 2003. Production of refined petroleum products was mostly higher in 2003 because of increased domestic demand for petroleum products that accompanied the recovery of the economy in early 2003 (table 1).

Trade

Japan was a net importer of minerals because of its large imports of mineral fuels. Japan's mineral trade deficit increased to \$78.8 billion in 2003 from \$63.8 billion in 2002 as a result of higher import bills for almost all mineral fuels and nonfuel minerals and despite higher export earnings from most of minerals and mineral products in 2003 (table 4).

Total imports of minerals increased by 20.9% to \$117.3 billion and accounted for 30.7% of the total imports, which were valued at \$382.8 billion in 2003. Of the total minerals imports, \$81.0 billion was for such mineral fuels as coal, LNG, crude and partially refined petroleum, refined petroleum products, and other mineral fuels; \$7.5 billion, for ores and concentrates of ferrous and nonferrous minerals, slag, scrap, and ash of iron and steel, other metals, and metal compounds; and \$1.2 billion, for such industrial minerals as cement, earths and stone, lime, plastering materials, salt, and sulfur. Imports of processed minerals, mineral-related chemicals, and metals totaled \$27.6 billion, of which \$4.0 billion was for mineral-related chemicals and fertilizers; \$14.6 billion, for products of iron and steel and nonferrous, rare, and other base metals; \$5.7 billion, for precious and semiprecious stones and precious metals; and \$3.3 billion, for articles and products of asbestos, cement, ceramics, glass, mica, and stone (Ministry of Finance, 2003b, p. 9-13, 15-16, 34-41).

Total exports of minerals, mineral-related chemicals, and processed minerals products increased by 15.9% to \$38.5 billion and accounted for 8.2% of Japan's total exports, which were valued at \$470.7 billion in 2003. Exports of iron and steel products and nonferrous, rare, and other base metals totaled \$27.3 billion. Exports of processed mineral articles and products of asbestos, cement, ceramics, glass, mica, and stone amounted to \$4.7 billion. Exports of cement, earths and stone, lime, mineral fuels, nonferrous minerals, plastering materials, salt, and sulfur were \$2.0 billion. Exports of mineral-related chemicals and fertilizer were \$2.4 billion. Exports of precious and semiprecious stones and precious metals were \$2.1 billion (Ministry of Finance, 2003a, p. 9-13, 15-16, 34-41). Physical measures of the exports and imports of mineral commodities in 2001 and 2002 are listed in tables 10 and 11.

Structure of the Mineral Industry

Japan's mineral industry consisted of a small mining sector of coal and nonferrous metals, a large mining sector of industrial minerals, and a large mineral-processing sector of ferrous and nonferrous metals and industrial minerals (table 2). Mining and mineral-processing businesses were owned and operated by private companies incorporated in Japan.

In the mining sector, the number of major nonferrous metal mines remained at two in 2003. The major industrial mineral mines totaled about 40 in 2003. The coal mining sector consisted of 11 small-scale open pit mines mostly in Hokkaido Prefecture and one underground mine at Kushiro in Hokkaido Prefecture, which was owned and operated by Kushiro Coal Mining Co. Ltd.

Japan's mining capacity of nonferrous metals (mainly gold, lead, silver, and zinc) and coal had decreased substantially in the past 2 years. The number of persons employed by the mining sector totaled about 50,000 in 2003, unchanged from that of 2002 (Statistical Handbook of Japan, 2004§).

In the mineral-processing sector, the iron and steel industry continued to cut the number of employees to 155,325 from 165,932 in 2002. The industry's production capacity of pig iron decreased to 84.4 million metric tons per year (Mt/yr) from 93.2 Mt/yr in 2002, and production capacity of crude steel decreased to 120.5 Mt/yr from 144.8 Mt/yr in 2002. In the nonferrous metal industry, which included smelting and refining of copper, gold, lead, silver, zinc, and other minor metals, the number of its regular employees was reduced to 5,572 from 5,664 in 2002. In 2003, Japan's production capacity of refined copper remained at 1.5 Mt/yr; refined gold increased to 182.4 metric tons per year (t/yr) from 164.4 t/yr in 2002; refined lead remained at 275,000 t/yr; refined silver increased to

2,980 t/yr from 2,920 t/yr in 2002; and zinc remained at 750,000 t/yr. Japan's electrolytic manganese dioxide production capacity decreased by 19,000 t/yr to 58,000 t/yr largely as a result of the closure of the Takaoka plant by Japan Metal & Chemical Co. Ltd. in Toyama Prefecture. Japan's cement industry cut the number of its regular employees by 176 to 3,660 and reduced its cement clinker capacity to 81.4 Mt/yr from 82.9 Mt/yr (Ministry of Economy, Trade and Industry, 2003a, p. 130, 135; 2003c, p. 94-95, 148, 150; Arumu Publishing Co. Ltd., 2004, p. 50).

Commodity Review

Metals

Alumina and Bauxite.—Japan was 100% reliant on imports of bauxite for the production of alumina and aluminum hydroxide. In 2003, imports of bauxite increased by 7.5% to 2.01 million metric tons (Mt) valued at \$52.5 million. The major supplying countries of bauxite in 2003 were Australia (56%), Indonesia (34%), and India (7%). Production of alumina and aluminum hydroxide was by Nippon Light Metal Co. Ltd. (NLM) at its Shimizu plant in Shizuoka Prefecture with a capacity to produce 365,000 t/yr of aluminum hydroxide and 163,000 t/yr of alumina, Showa Denko K.K. at its Yokohama plant in Kanagawa Prefecture with a capacity to produce 220,000 t/yr of aluminum hydroxide and 105,000 t/yr of alumina, and Sumitomo Chemical Co. Ltd. at its Ehime plant in Ehime Prefecture with a capacity to produce 200,000 t/yr of aluminum hydroxide and 105,000 t/yr of alumina (Japan Aluminum Association, 2003, p. 11).

Demand for domestically produced aluminum hydroxide was estimated to be about 380,000 metric tons (t) in 2003. Consumption by end user, in decreasing order, was mainly for the manufacturing of flocculant, for rubber and plastic, and for synthetic zeolite. Consumption of alumina, in decreasing order, was mainly for the manufacturing of abrasives, ceramics, refractories, and welding rods. In 2003, Japan exported 136,000 t of aluminum hydroxide mainly to the Republic of Korea, Taiwan, and Thailand; and exported 155,000 t of alumina mainly to China, the Republic of Korea, and Taiwan (Japan Aluminum Association, 2003, p. 20; Ministry of Finance, 2003a, p. 112).

In 2003, four major Japanese trading companies invested a total of about \$83 million in overseas alumina refining projects in Australia and Brazil. Nissho Iwai Corp. and Itochu Corp. invested about \$52 million to raise their equity shares in Worsley Alumina Pty. by acquiring shares from Kobe Steel Co. Ltd. and to increase their stake in bauxite mining and alumina refining operations in Australia. After completion of the acquisition, Nissho Iwai Corp. and Itochu Corp. would hold 9% and 5% stakes, respectively, in Worsley Alumina; Mitsui & Co. Ltd. and Mitsubishi Corp. invested \$21 million and slightly less than \$10 million for a 1.47% and 0.64% stake, respectively, in Alumina do Norte do Brasil SA (Alunorte). Mitsui and Mitsubishi for the first time had the right to market about 100,000 t/yr of Alunorte's alumina (Japan Metal Review, 2003b; Nikkei Weekly, 2003a).

Aluminum.—Production of primary aluminum (unwrought aluminum) by NLM at the Kambara smelter in Shizuoka Prefecture was insignificant. Virtually all Japan's requirements for primary aluminum were met by imports. In 2003, imports of primary aluminum increased by 14% to 2.94 Mt valued at \$4.37 billion, of which 2.04 Mt was ingot and 899,215 t was alloys (Ministry of Finance, 2003b, p. 665).

Of the total primary aluminum imports, about 46% was supplied from Japan's 11 overseas aluminum smelter projects; Japanese aluminum and major trading companies held substantial equity shares in those smelters in Australia, Brazil, Canada, Indonesia, Mozambique, New Zealand, the United States, and Venezuela (table 5). In 2003, Japan diversified its import sources of primary aluminum and aluminum alloy into 55 countries worldwide. Among the 55 countries, the major suppliers were Russia (24.5%), Australia (20.1%), Brazil (9.3%), China (9.1%), New Zealand (7.3%), South Africa (6.9%), Indonesia (5.2%), Canada (4.7%), the United Arab Emirates (3.1%), and Venezuela (2.9%). The United States supplied only 8,550 t and accounted for 0.3% of imported primary aluminum and aluminum alloys (Ministry of Finance, 2003b, p. 665).

Japan resumed imports of primary aluminum from Venezuela in early 2003 after a disagreement on new price terms was resolved between Industria Venezolana de Aluminio C.A. (Venalum) and the Japanese consortium of Kobe Steel, Marubeni Corp., Mitsubishi Materials Corp., Mitsubishi Aluminium Co., Ltd., Showa Denko, and Sumitomo Chemical in November 2002. In 2003, Japan imported about 86,000 t of primary aluminum from Venezuela or 20% of Venalum's output (Mining Journal, 2003b).

Exports of primary aluminum, which included aluminum alloys (13,200 t) and aluminum ingots (4,960 t), totaled 18,200 t and were valued at \$42.7 million. The major buyers of aluminum ingot in 2003 were Thailand (57.4%), China (16.8%), the Philippines (5.7%), India (5.5%), and Indonesia (5.5%). The major buyers of aluminum alloys were the Republic of Korea (45.5%), Indonesia (16.2%), Thailand (9.6%), and China (7.8%) (Ministry of Finance, 2003a, p. 576).

Cadmium.—In 2003, Japan was the leading producer and consumer of cadmium in the world. Cadmium was produced mainly as a byproduct of zinc refining operations that mostly used ore imported mainly from Australia, Canada, Peru, and the United States. According to the Japan Mining Industry Association, cadmium was produced by Toho Zinc Co. Ltd. (813 t), Dowa Mining Co. Ltd. (640 t), Sumitomo Metal Mining Co. Ltd. (407 t), Nippon Mining and Metals Co. Ltd. (NMM) (323 t), and Mitsui Mining and Smelting Co. Ltd. (314 t) in 2003 (Arumu Publishing Co. Ltd., 2004, p. 110).

Because of the continued increase in consumption of electrodes for nickel-cadmium (Ni-Cd) batteries, imports of cadmium ingot and powder jumped by 35.5% to 3,820 t valued at \$5.6 million. The major suppliers were the Republic of Korea (32.2%), Russia (20.5%), Canada (13.6%), Germany (8.2%), and Peru (8.0%) (Ministry of Finance, 2003b, p. 673).

In 2003, demand for domestically produced cadmium decreased by 8.1% to 2,380 t, of which 2,210 t was consumed for production of Ni-Cd batteries; 27 t, for production of alloys; 3 t, for plating; 2 t, for production of pigments; and 135 t for other end users (Bulletin of Japan Mining Industry Association, 2004, p. 114).

Chromium.—Japan relied on imports to meet all chromium ore and concentrate requirements for its iron and steel industry. Because production capacity of ferrochromium was reduced, Japan's imports of chromium ore and concentrate dropped sharply by 48% to 185,000 t valued at \$14.7 million in 2003. The major suppliers were India (47.1%), South Africa (40.1%), and Iran (5.4%) (Ministry of Finance, 2003b, p. 169).

Consumption of chromium ore and concentrate by the iron and steel industry decreased by 44% to 166,000 t, of which only 38,500 t was consumed by the ferroalloy industry, and 128,000 t, by others. The iron and steel industry's yearend inventory of chromium ore decreased by 69% to 45,000 t, which was equivalent to about 3 months of consumption in 2003 (Ministry of Economy, Trade and Industry, 2003c, p. 90).

Domestically produced ferrochromium decreased by 78.9% to 19,400 t in 2003. This sharp decline was a direct result of a plant closure by Shunan Denko K.K. in Yamaguchi Prefecture and a plant idling by NKK Materials in Toyama Prefecture in 2003. Imports of ferrochromium increased by 16.6% to 914,000 t valued at \$435.2 million owing to increased demand by stainless steel producers. The major overseas suppliers of ferrochromium were South Africa (59.8%), Kazakhstan (20.4%), Zimbabwe (8.2%), China (5.2%), and India (3.5%) (Ministry of Finance, 2003b, p. 627).

Consumption of ferrochromium, which included high-carbon ferrochromium (851,000 t) and low-carbon ferrochromium (42,300 t), increased by 6.2% to 894,000 t, of which 888,000 t was consumed by stainless steel manufacturers, and 5,640 t, by ferroalloy producers (Ministry of Economy, Trade and Industry, 2003c, p. 204). Exports of ferrochromium totaled 2,240 t valued at \$4.9 million, of which 2,160 t was low-carbon ferrochromium and 83 t, high-carbon ferrochromium. The major buyers of ferrochromium were the United States (82.4%) and Thailand (15.5%) (Ministry of Finance, 2003a, p. 498).

Production of chromium metal was by NKK Materials, which operated a 1,000-t/yr plant that used the silicothermic method at Shinminato in Toyama Prefecture, and by Nippon Denko Co. Ltd., which operated an 800-t/yr plant that used the aluminothermic reduction method at Oshima, a few kilometers south of Shinminato in Toyama Prefecture. In Japan, chromium metal was consumed mainly for the manufacture of superalloys, heat resisting steel, and electronic materials. In 2003, Japan imported 2,930 t of chromium ingot and powder to meet its demand for chromium metal. The major suppliers were China (1,500 t), the United States (681 t), France (370 t), and the United Kingdom (305 t) (Arumu Publishing Co. Ltd., 2004, p. 100).

Cobalt.—Japan relied 100% on imported cobalt matte and other intermediate products of cobalt for metal production. Sumitomo Metal Mining, which was Japan's sole producer of cobalt metal and cobalt salts (cobalt sulfate and cobalt oxide), operated a cobalt refinery in Niihama, Ehime Prefecture, with a capacity of 600 t/yr (Arumu Publishing Co. Ltd., 2004, p. 74). Japan also imported cobalt hydroxide, metal, oxide, and powder to meet its cobalt requirements.

In 2003, imports of cobalt matte, other intermediate products of cobalt, cobalt ingot, and other articles of cobalt totaled 12,700 t valued at \$249.1 million. The major suppliers were Australia (23.0%), Finland (21.3%), Canada (15.8%), Zambia (11.9%), Norway (8.3%), Congo (Brazzaville) and Congo (Kinshasa) (4.4% combined), Belgium (3.8%), and Morocco (2.7%). Japan also imported 2,900 t of cobalt oxide and 603 t of cobalt hydroxide. Belgium and Finland were the two principal suppliers of cobalt oxides and accounted for 65.1% and 26.3%, respectively, and of cobalt hydroxide and accounted for 55.2% and 26.9%, respectively. Imports of cobalt oxide and hydroxide amounted to \$65.4 million (Ministry of Finance, 2003b, p. 181, 673).

In 2003, domestic demand for cobalt metal increased by 72.1% to 3,540 t, of which 1,040 t was for specialty steel; 404 t, for pipe, plate, rod, and wire; 307 t, for ultrahard tool steel (cemented carbides); 173 t, for manufacturing of magnetic materials; 257 t, for catalysts; and 1,360 t, for other end uses (Ministry of Economy, Trade and Industry, 2003c, p. 272). According to an estimate by Mitsui & Co., the overall demand for cobalt, which included ingot, oxide, powder, and salt, was estimated to be 10,000 t in 2003 compared with 8,200 t in 2001 and 9,500 t in 2002 (Arumu Publishing Co. Ltd., 2004, p. 74).

Copper, Lead, and Zinc.—Toyoha Mining Co. Ltd., which operated the Toyoha Mine in Hokkaido Prefecture, was Japan's sole lead and zinc mining company. In 2003, the mine produced about 389,000 t of crude ore and the mill produced about 5,700 t of lead and about 44,600 t of zinc in concentrates. The mill also produced about 70 t of byproduct silver and a very small amount of byproduct copper in lead and zinc concentrates. Japan relied on imported ores and concentrates for 87.4% of its copper smelters' raw materials requirements, 44.5% of its lead smelters' raw material requirements, and 74.2% of its zinc smelters' requirements for the production of refined copper, refined lead, and refined zinc.

In 2003, Japan was the world's leading importer of copper concentrate and one of the world's major importers of lead and zinc concentrates. Imports of copper concentrate decreased to 4.1 Mt from 4.2 Mt in 2002. The import bill of copper ore and concentrates increased to \$2.4 billion from \$2.07 billion in 2002. The major suppliers of copper concentrate were Chile (44.7%), Indonesia (16.6%), Australia (10.1%), Canada (9.6%), Papua New Guinea (8.2%), and Peru (4.6%). Imports of lead concentrates increased to 184,500 t valued at \$71.8 million from 155,000 t valued at \$57 million in 2002. The major suppliers of lead concentrate were the United States (47.3%), Australia (26.1%), and Peru (14.6%). Imports of zinc ore and concentrates were about the same as 2002 (1 Mt), but the import bill for zinc ore and concentrates increased to \$238.2 million from \$198 million in 2002. The major suppliers of zinc concentrate were Australia (41.7%), Peru (18.7%), the United States (12.7%), Canada (10.4%), Bolivia (5.4%), and Mexico (4.4%) (Ministry of Finance, 2003b, p. 169).

Nittetsu Mining Co. Ltd. completed development of the Atacama Mine (formerly known as El Bronce Project) in Chile. In a joint venture with Inversiones Errazuriz Ltda. of Chile, Nittetsu Mining completed the development of the Atacama Mine in Chile in December 2002. The mine began test operation in January 2003 and started full operation in June 2003. The mine was operated and

managed by Minera Atacama Kozan, which was the joint venture between Nittetsu Mining (60%) and Inversiones Errazuriz (40%) established in May 1999. Shipments of copper ore and concentrate to Japan were expected to start in late 2003 or early 2004 (Nittetsu Mining Co. Ltd., 2003§). The mine was expected to produce 74,000 t of copper concentrate in 2003 and 92,000 t in 2004. Nittetsu intended to take between 35,000 and 46,000 t for shipment to Japan and market the remainder in Chile or ship to the Port Kembla refinery in Australia (Metal Bulletin, 2003).

Sumitomo Metal Mining reportedly held talks with South American-based copper producers to acquire two copper mines in South America and was prepared to invest up to \$260 million in the two unnamed mines (Mining Journal, 2003a).

In July, two unnamed Japanese copper producers reportedly reached an agreement with Companhia Vale Do Rio Doce S.A. (CVRD) of Brazil to import 50,000 t/yr of copper concentrates for 5 years beginning in 2005 from the Sossego Mine, which is located in the northern State of Para in Brazil. Ore reserves at the Sossego Mine were estimated to be 196 Mt at a grade of 1.02% copper plus 0.3 gram per metric ton (g/t) of gold. CVRD began developing the mine in 2003 and was scheduled to start operation with production of 140,000 t/yr of copper concentrate in the second quarter of 2004 (Japan Metal Review, 2003a).

Also in July, Mitsubishi Materials announced that it was to withdraw from its one-third general partnership interest in Chino Mines Co. in the United States, which it held through Heisei Minerals Corp. (Mitsubishi Materials' subsidiary in the United States). Declining revenues and increased losses from the Chino Mine were cited as the main reasons for the withdrawal. Phelps Dodge Corp., which held the remaining two-thirds general partnership interest in Chino Mines, reportedly completed acquisition of the Heisei interest from Mitsubishi Material in December 2003 (Japan Metal Review, 2003c).

Metal production of copper decreased in 2003 because of the weaker domestic demand for wire and decreased exports. Metal production of lead and zinc increased owing to slightly higher domestic demand for lead and zinc in 2003. Japan's capacity utilization rate of the nonferrous metals smelting and refining industry was 97.9% for copper, 82.4% for lead, and 86.8% for zinc, (Ministry of Economy, Trade and Industry, 2003c, p. 97-99, 148).

In fiscal year 2003, Sumitomo Metal Mining completed capacity expansion of its Toyo copper smelter and refining complex in Besshi, Ehime Prefecture, at an estimated cost of about \$121 million. The expansion project involved adjustments and modifications to the converter, flash furnace, flotation plant, tank house (refinery), and other facilities to raise refining capacity to 300,000 t/yr from 270,000 t/yr (Sumitomo Metal Mining Co. Ltd., 2003§).

For the purpose of conducting a feasibility study for a semicommercial-scale plant that will use the Intec copper process, which is a patented hydrometallurgical process for the extraction of copper and precious metals from sulfide ore and concentrates, NMM completed construction of the Intec copper pilot plant at its Hitachi research and development facilities in Ibaraki Prefecture in October 2002. The 100-kilograms per day of capacity pilot plant was commissioned in January 2003. The results of ongoing test work would be employed as input into the feasibility study for the semicommercial-scale Intec copper plant. NMM's Intec copper pilot plant program was cofunded by the Japanese Government agency, New Energy and Industrial Technology Development Organization, and Mitsui Mining and Smelting (Wood, 2003§).

Imports of refined copper decreased by 31.1% to 78,800 t valued at \$137.4 million in 2003. The major suppliers of refined copper were Chile (67.4%), Zambia (22.7%), Peru (5.6%), and Indonesia (1.3%). Imports of refined lead decreased by 13.0% to 9,300 t valued at about \$8.3 million. The principal suppliers of refined lead were China (92.6%) and Peru (4.5%). Imports of zinc slab (refined zinc, not alloyed) increased sharply by 92.0% to 41,100 t valued at about \$35.5 million. The major suppliers of zinc slab were China (54.9%), Peru (31.8%), and Canada (8.7%) (Ministry of Finance, 2003b, p. 659, 669-670).

Domestic demand for refined copper held steady at about 1.16 Mt in 2003. Domestic demand for refined copper, by sector, was 714,000 t for wire and cable, 418,000 t for brass mill products, and 26,900 t for others (Ministry of Economy, Trade and Industry, 2003c, p. 258). Exports of refined copper decreased by 23.3% to 290,000 t valued at \$514.6 million in 2003. The major buyers of refined copper were Taiwan (44.5%), China (21.5%), Indonesia (13.3%), the Republic of Korea (10.6%), Thailand (7.0%), and the United States (1.8%). Exports of unrefined copper and copper anodes decreased by 79.5% to 10,300 t in 2003 valued at \$24.8 million. Most unrefined copper and copper anodes was exported to the Republic of Korea (46.2%), Taiwan (29.6%), and Hong Kong (11.7%) (Ministry of Finance, 2003a, p. 567).

In 2003, domestic demand for refined lead increased by 0.3% to 208,000 t, of which 166,000 t was for storage batteries; 20,600 t, for inorganic chemicals; 6,520 t, for solder; 2,930 t, for lead pipe and sheet; and 11,600 t, for other uses (Ministry of Economy, Trade and Industry, 2003c, p. 260). Exports of refined lead decreased by 21.8% to 8,080 t valued at \$4.2 million. The major buyers of refined lead were Thailand (31.8%), Malaysia (31.3%), and Indonesia (27.9%) (Ministry of Finance, 2003a, p. 581).

Domestic demand for zinc slab increased slightly to 485,000 t, of which 247,000 t was for sheet galvanizing; 83,300 t, for other plating; 64,600 t, for brass mill products; 46,200 t, for die-cast alloy; 23,900 t, for inorganic chemicals; and 19,700 t, for other uses (Ministry of Economy, Trade and Industry, 2003c, p. 264). Exports of zinc slab decreased by 32.7% to 63,900 t valued at \$53.2 million. The major buyers were Taiwan (35.4%), Indonesia (19.9%), Vietnam (19.2%), the Philippines (13.0%), Malaysia (5.0%), and Bangladesh (2.3%) (Ministry of Finance, 2003a, p. 582).

Gold and Silver.—Mine production of gold was mainly by Sumitomo Metal Mining from the Hishikari Mine in Kagoshima Prefecture on Kyushu Island. The company, which was working on its Honko (main mine) and Yamada deposits in the Hishikari mining area, produced about 184,000 t of ore and averaged 42 g/t gold or about 7.7 t of gold in 2003 (Bulletin of Japan Mining Industry Association, 2004, p. 137). Other small-scale gold and silver mines were the Arkesi and Kasuga in Kagoshima Prefecture. Toyoha Mining produced most of Japan's mined silver as a byproduct of lead and zinc mining operations from the Toyoha Mine in Hokkaido Prefecture. Overall mine production of gold and silver was 8,140 kilograms (kg) and 78,900 kg, respectively (Ministry of Economy, Trade and Industry, 2003d, p. 132).

Overseas, Sumitomo Metal Mining (51%) and its partners Teck Cominco Ltd. (40%) of Canada and Sumitomo Corp. (9%) were still waiting for permits for the development of the Pogo underground gold mine near Delta, east of Fairbanks in Alaska. In March, U.S. Federal and State agencies reportedly had released the long-awaited draft environmental impact statement (EIS) for the Pogo gold project. The U.S. Environmental Protection Agency (EPA) was leading the Federal EIS process, with the participation of the Alaska State Department of Natural Resources because the Pogo gold deposit is on State-owned land. A final EIS and record of decision by the EPA were to be issued following a 60-day public comment period, and public hearings in Delta and Fairbanks. All permits for the project were to be issued by the end of 2003, and construction of the Pogo gold project could be started in 2004 (Bradner, 2003§). By August 2003, according to a report by the Japan Economic Journal, Sumitomo Metal Mining and Teck Cominco were said to have been given a green light to develop the \$330 million Pogo gold project. The mine was expected to start production in 2005 at a rate of 12.5 t/yr of gold (Mining News.net, 2003§).

In 2003, production of refined gold and silver increased by 11.5% and 8.6%, respectively, owing mainly to higher prices of gold and silver in the domestic market. Imports of gold (ingot and powder) decreased by 46.4% to 43,100 kg. Imports of silver (ingot and powder) increased by 43.3% to 1,270 t. The major suppliers of gold ingot and powder were Switzerland (39.8%), Australia (20.9%), Uzbekistan (16.2%), Canada (6.8%), Hong Kong and Kyrgyzstan (3.5% each), and the United States (2.9%). The major suppliers of silver ingot and powder were Peru (28.4%), Mexico (23.5%), Australia (16.7%), the Republic of Korea (15.3%), the United States (7.1%), and China (4.3%). Imports for gold ingot and powder were valued at \$491.6 million, and for silver ingot and powder, \$201 million (Ministry of Finance, 2003b, p. 621).

Domestic demand for gold, which included dental and medical, electrical and electronic, industrial arts and crafts, jewelry, and private investment, decreased to 288,000 kg from 303,000 kg in 2002. Domestic demand for gold by end user was for dental and medical, 22,400 kg; electrical, electronic, and communication apparatus, 85,100 kg; private hoarding, 79,500 kg; gold plating, 23,500 kg; jewelry, 20,500 kg; industrial arts and crafts, 4,880 kg; pottery and porcelain, 1,530 kg; decorations and badges, 1,500 kg; and other uses, which included fountain pens and watches, 49,100 kg (table 6). Among the end users, demand for jewelry reached a new low at 20,500 kg in 2003 (Arumu Publishing Co. Ltd., 2004, p. 115).

Domestic demand for silver increased slightly to 2,690 t from 2,670 t in 2002. Domestic demand for silver by end user was for silver nitrate for photography, 1,370 t; silver nitrate for other uses, 295 t; rolled products, 228 t; electrical contacts, 219 t; brazing alloy (silver solder), 95 t; and other uses, 474 t (table 6). The substantial decline in silver nitrate demand for photography was offset by increased demand for silver nitrate for other uses and for electrical contacts (Ministry of Economy, Trade and Industry, 2003c, p. 278).

Exports of refined gold ingot and powder increased by 317.3% to 22,300 kg valued at \$252.8 million in 2003. The major buyers of refined gold ingot and powder were the United Kingdom (43.8%), Hong Kong (22.5%), Switzerland (15.2%), South Africa (5.0%), the Republic of Korea (4.9%), Malaysia (2.8%), and Singapore (2.4%). Exports of silver ingot and powder increased by 22.5% to 440.5 t valued at \$28.2 million. The major buyers of refined silver and powder were Singapore (20.8%), Taiwan (20.3%), the Republic of Korea (18.5%), China (16.6%), Hong Kong (13.2%), the United States (3.5%), the United Kingdom (3.1%), and Malaysia (2.0%) (Ministry of Finance, 2003a, p. 493-494).

Iron and Steel.—Japan relied 100% on imports to meet the iron ore requirements of its iron and steel industry. In 2003, imports of iron ore totaled 132.1 Mt valued at \$3.3 billion. The average cost, insurance, and freight (c.i.f.) import price of iron ore per metric ton was \$25.02 compared with \$23.54 in 2002. The major suppliers of iron ore were Australia (60.8%), Brazil (18.1%), India (10.7%), South Africa (3.9%), and the Philippines (3.3%). Imports of pig iron totaled 559,000 t valued at \$104.9 million. The average c.i.f. import price of pig iron per metric ton was \$187.54 compared with \$136.72 in 2002. The major suppliers of pig iron were China (61.7%), Russia (10.7%), India (9.8%), Brazil (5.7%), North Korea (5.1%), the Republic of Korea (3.6%), and South Africa (3.4%) (Ministry of Finance, 2003b, p. 169, 626).

In 2003, consumption of iron ore by the iron and steel industry increased by 0.9% to 114.9 Mt, of which 104 Mt was for ironmaking by blast furnaces; 824,000 t, for steelmaking; and 90,700 t, for other uses. Consumption of other iron ore raw materials by the iron and steel industry included 3.1 Mt of pellets, 673,000 t of iron sand, 204,000 t of ferruginous manganese ore, and 11.8 Mt of other iron ore materials. The industry also consumed 45.1 Mt of iron and steel scrap. Consumption of other major raw materials included 12.4 Mt of limestone, 4.8 Mt of quicklime, 1.5 Mt of dolomite, 1.4 Mt of serpeninite, 462,000 t of silica stone, and 163,000 t of fluorite (Ministry of Economy, Trade and Industry, 2003c, p. 84-86, 90-92).

In 2003, pig iron production increased by 1.4% to 82.1 Mt, of which 81.5 Mt was for steelmaking and 605,000 t, for foundry. The total ironmaking capacity decreased to 84.4 Mt/yr from 93.2 Mt/yr in 2002, and the number of blast furnaces (30) and other furnaces (1) for ironmaking decreased to 31 from 39 in 2002 (Ministry of Economy, Trade and Industry, 2003c, p. 28, 94).

Crude steel production increased by 2.6% to 110.5 Mt in 2003, of which 73.6% was processed by basic oxygen furnaces, and 26.4%, by electric furnaces. In the steelmaking sector, the number of basic oxygen furnaces decreased to 62 from 63 in 2002, and the number of electric arc furnaces decreased to 354 from 366 in 2002. The overall crude steel production capacity decreased to 120.5 Mt/yr from 144.8 Mt/yr in 2002 (Ministry of Economy, Trade and Industry, 2003c, p. 39, 94).

In 2003, Japan was the world's second leading producer of crude steel and accounted for 11.5% of the world total (International Iron and Steel Institute, 2004§). Among Japan's top four steelmakers in 2003, Nippon Steel Corp., which produced 31.3 Mt of crude steel, was the 3d leading steel-producing company in the world after Arcelor S.A. of Luxembourg and the LNM Group of the Netherlands Antilles; JFE Steel Corp. (comprising the former NKK Corp. and Kawasaki Steel Corp.), which produced 30.2 Mt, ranked 4th; Sumitomo Metal Industries, Ltd., which produced 12.8 Mt, ranked 14th; and Kobe Steel Ltd., which produced 7.3 Mt, ranked 25th.

In 2003, all four integrated steelmakers expected to exceed their targeted sales and to see their combined pretax profit climbing 150% to \$1.5 billion in the first half of the fiscal year ending September 30, 2003, owing to higher prices of steel products; stronger sales to the domestic automobiles, machinery and equipment, and shipbuilding industries; and strong exports to Asia, especially to China (Nikkei Weekly, 2003c).

After merger in September 2002, Kawasaki Steel and NKK continued to operate as fully owned subsidiaries of JFE Holdings Inc. during the transition period between September 27, 2002, and March 31, 2003. Beginning in April 2003, however, the two steel companies were reorganized into five new operating companies—JFE Steel Corporation; JFE Engineering Corporation; JFE Urban Development Corporation; Kawasaki Microelectronics, Inc.; and JFE R&D Corporation. Under JFE Steel, Kawasaki Steel's production plants in Okayama, Chiba, and Hyogo Prefectures merged with NKK's production plants in Hiroshima and Kanagawa Prefectures. The merger of the plants resulted in the establishment of JFE Steel's three steel works. East Japan Works comprised production plants in Chiba, Chiba Prefecture; Nishinomiya, Hyogo Prefecture; and Keihin (Kawasaki), Kanagawa Prefecture. West Japan Works comprised production plants in Fukuyama, Hiroshima Prefecture; and Kurashiki, Okayama Prefecture. Chita Work comprised only one plant in Handa, Aichi Prefecture (JFE Holdings Inc., 2004§; JFE Steel Corporation, 2004§).

To develop high-grade steel sheet for the next generation of automobiles, the major Japanese steelmakers set up an alliance with their European counterparts in 2003. Nippon Steel Corp. and Arcelor SA of Luxembourg were to jointly develop surface-processed steel sheet used in frames and bodies. The two companies would produce highly resilient steel products that help make lighter vehicles. After the steel is galvanized, it is reheated at high temperatures to produce a galvanized steel sheet that would be more resistant to corrosion and easier to paint. JFE Holdings began joint development with Germany's Thyssen-Krupp Steel AG to produce two types of high-tensile surface-process steel products. Sumitomo Metal Industries and Corus Group Plc of the United Kingdom were to commercialize a new steel sheet product and had exchanged technologies for surface-processing and strengthening. Kobe Steel Ltd. and Voestalpine Stahl GmbH of Austria were to jointly develop high-tensile steel sheet, which has two to three times more strength than conventional steel sheet (Nikkei Weekly, 2003b).

In 2003, domestic demand for steel increased by only 1.8% to about 64.5 Mt, of which 53.4 Mt was ordinary steel products, and 11.1 Mt, specialty steel products. The increase in overall domestic demand for steel was owing mainly to the stronger demand by the manufacturers of automobiles, electric machinery and equipment, industrial machinery and equipment, and shipbuilding and marine equipment. Domestic demand, as measured by orders for ordinary and specialty steels, increased in most end-use categories except construction (table 7).

In 2003, exports of iron and steel decreased by 5.3% to 34.4 Mt because of reduced exports to Africa, North America, and South America. Exports to Asia decreased slightly but remained strong, especially to Thailand, to which exports rose by 7.3% (table 8). Of the total exports of iron and steel, 73.0% was ordinary steel products; 15.4%, specialty steel products; 8.8%, steel ingots and semifinished products; 1.5%, secondary products; and 0.3%, pig iron (Japan Iron and Steel Federation, 2004§).

In 2003, exports of iron and steel products to Asian markets decreased by 4.1%. Exports to the Middle Eastern and European markets, however, increased by 9.1% and 4.1%, respectively, and to Oceania markets by 5.1%; exports to North American and South American markets decreased by 24.4%, and to African markets by 15.7%. Iron and steel exports to the United States dropped by 27.5% to 1.1 Mt (table 8).

Imports of iron and steel products increased by 13.2% to 6 Mt in 2003; this was a rebound following 2 consecutive years of decline. Of the total imports, 2.8 Mt was ordinary steel products; 2.5 Mt pig iron, ferroalloys, steel ingot, and semimanufactured steel; 431,000 t, wire and wire products; and 125,000 t, specialty steel products (Japan Iron and Steel Federation, 2003, p. 18-19). Among the major suppliers of all steel products, the Republic of Korea and Taiwan accounted for more than 90% of total steel products imported by Japan (Japan Iron and Steel Federation, 2004§).

Manganese.—Japan relied entirely on imports to meet its manganese raw material requirements for the iron and steel and electrolytic manganese dioxide (EMD) industries. In 2003, Japan imported 1.03 Mt of high-grade manganese ore, 81,000 t of ferruginous manganiferous ore, 78,200 t of low-grade manganese ore, and 1,980 t of high-grade manganese dioxide ore. The major suppliers of high-grade manganese dioxide ore were Gabon (56.6%), Colombia (32.3%), and China (11.1%). The major suppliers of high-grade manganese ore were South Africa (66.1%) and Australia (30.7%). The major suppliers of low-grade manganese ore were Ghana (76.3%) and South Africa (19.4%). The major suppliers of ferruginous manganiferous ore were India (60.6%) and South Africa (35.9%). The import bill for manganese ores totaled \$121.5 million (Ministry of Finance, 2003b, p. 169).

Consumption of manganese ore for the production of ferroalloys increased by 2.0% to 659,000 t, for steelmaking decreased by 13.6% to 144,000 t, and for other uses increased by 117.9% to 170 t in 2003. Production of ferromanganese increased by 4.2% to 372,000 t (Ministry of Economy, Trade and Industry, 2003c, p. 29). Imports of ferromanganese increased by 50.4% to 87,300 t. The major suppliers were Australia (36.0%), China (34.6%), South Africa (25.8%), and the Republic of Korea (3.1%) (Ministry of Finance, 2003b, p. 626-627).

Consumption of domestically produced high- and low-carbon ferromanganese for steelmaking decreased by 3.6% to 394,000 t, of which 332,000 t was high-carbon ferromanganese, and 62,400 t, low-carbon ferromanganese (Ministry of Economy, Trade and Industry, 2003c, p. 204). Exports of ferromanganese increased by 17.4% to 17,400 t. The major buyers were Taiwan (34.8%), the United States (23.8%), Malaysia (13.9%), Saudi Arabia (10.3%), the Republic of Korea (7.0%), and Thailand (6.5%). Export earnings from ferromanganese were valued at \$13.8 million (Ministry of Finance, 2003a, p. 497).

In 2003, Japan was the world's leading producer of EMD. Japan's EMD producers were Mitsui Mining and Smelting, which operated the Takehara plant (24,000 t/yr) in Hiroshima Prefecture, and Tosoh Corp., which operated the Hyuga plant (34,000 t/yr) in Miyazaki Prefecture and the Thessaloniki (Salonika) plant (18,000 t/yr) in Greece. In 2003, Mitsui Mining and Smelting permanently

closed its County Cork plant (19,000 t/yr) in Ireland owing to a slowdown in demand, a weaker U.S. dollar, increased competition from the Far East, and the growth of private-label brands and rechargeable batteries. The company had operated its Cork plant for the past 27 years. The 100-acre plant site in Little Island, County Cork, was sold to South Coast Transport Limited in December for more than €15 million or more than \$18.4 million (RTE News, 2003§; Sunday Business Post Online, 2003§).

Of the 49,000 t of EMD produced in 2003, about 26,000 t was consumed domestically for the production of batteries, and 22,500 t was exported. The major buyers were Indonesia (35.3%), Singapore (18.0%), China (15.1%), the Republic of Korea (10.3%), the United States (9.6%), and Thailand (2.7%). Export earnings from manganese dioxides were valued at \$28.1 million in 2003 (Ministry of Finance, 2003a, p. 112; Arumu Publishing Co. Ltd., 2004, p. 50). Japan imported 3,220 t of manganese dioxide valued at \$3.7 million, of which China provided more than 77%; other major suppliers were South Africa (9.0%) and Belgium (6.1%) (Ministry of Finance, 2003b, p. 181).

Nickel.—Japan relied 100% on imported raw materials to meet its nickel requirements in 2003. Japan was the world's leading importer and consumer of nickel and the second leading producer of nickel metal after Russia (International Nickel Study Group, 2004, p. 8, 10). All nickel ores and nickel mattes were imported for the production of ferronickel, nickel chemicals (salts), nickel oxide sinter, and refined nickel. Additionally, ferronickel, nickel powder and flake, nickel oxide sinter, nickel waste and scrap, and refined nickel also were imported to meet the nickel requirements of the battery, magnetic materials, nonferrous alloys, and specialty steel industries as well as other end users.

Imports of nickel ore decreased by 4.5% to 4.2 Mt valued at \$171.3 million. The suppliers of nickel ore were Indonesia (56.1%), the Philippines (23.9%), and New Caledonia (20.0%). Imported nickel ore from Indonesia contained 38,000 t of nickel; from the Philippines, 16,900 t of nickel; and from New Caledonia, 15,200 t of nickel. Imports of nickel mattes, in gross weight, increased by 18.2% to 120,000 t valued at \$671.0 million in 2003. The suppliers of nickel matte were Indonesia (73.8%) and Australia (26.2%). Imported nickel mattes from Indonesia contained 66,400 t of nickel and from Australia, 23,600 t (Bulletin of Japan Mining Industry Association, 2004, p. 108).

Imports of ferronickel, in gross weight, increased by 13.8% to 57,000 t valued at \$153.3 million. The suppliers of ferronickel were New Caledonia (65.9%), Colombia (15.9%), the Dominican Republic (11.1%), and Indonesia (7.0%). Imports of refined nickel increased by 32.6% to 53,600 t valued at \$477.4 million. The top suppliers of refined nickel were Russia (17.0%), Australia (16.6%), Zimbabwe (15.1%), South Africa (12.9%), Norway (9.0%), China (8.7%), Canada (6.6%), Brazil (6.5%), and the United Kingdom (5.1%).

Imports of nickel oxide sinter, in gross weight, increased by 7.6% to 1,230 t valued at \$9.3 million; Australia was the dominant supplier of nickel oxide sinter and accounted for 97.4%. Imports of nickel powders and flakes decreased by 20.9% to 7,730 t valued at \$80.1 million. The major suppliers of nickel powders and flakes were the United Kingdom (42.8%) and Canada (42.3%). Imports of nickel waste and scrap decreased by 24.0% to 10,700 t valued at \$73.9 million. The major suppliers of nickel waste and scrap were the Netherlands (33.9%), the United States (23.5%), the Republic of Korea (9.5%), Taiwan (7.7%), and Russia (6.6%) (Ministry of Finance, 2003b, p. 169, 627, 664).

In 2003, consumption of nickel ore by the ferroalloy industry increased by 3% to 3.5 Mt. Production of ferronickel was by Hyuga Smelting Co. Ltd. (a wholly owned subsidiary of Sumitomo Metal Mining) in Hyuga, Miyazaki Prefecture; Nippon Yakin Kogyo Co. Ltd. at Oheyama, Miyazu, Kyoto Prefecture; and Pacific Metals Co. Ltd. in Hachinohe, Aomori Prefecture. Production of ferronickel decreased by 0.5% to 369,000 t, which contained about 74,800 t of nickel. Consumption of ferronickel for steelmaking, in gross weight, decreased by 0.1% to 308,000 t (Ministry of Economy, Trade and Industry, 2003c, p. 33, 91, 210). Exports of ferronickel decreased by 15.0% to 102,000 t valued at \$166.1 million, of which 51.7% went to the Republic of Korea, and 48.3%, to Taiwan (Ministry of Finance, 2003a, p. 498).

Refined nickel was produced solely by Sumitomo Metal Mining at its nickel refinery that used its matte chlorine leaching electrowinning process in Niihama, Ehime Prefecture. The 36,000-t/yr nickel refinery used imported nickel matte from Australia and Indonesia to produce refined nickel and nickel salts for domestic consumption and exports. Tokyo Nickel Co. Ltd. operated a 60,000-t/yr smelter in Matsuzaka, Mie Prefecture, which also used imported nickel matte to produce briquettes, granules, and nickel oxide sinters for domestic consumption and exports.

To secure new nickel raw material resources for its Niihama complex for nickel and cobalt refining, Sumitomo Metal Mining was constructing a processing plant at Rio Tuba in the southern part of Palawan Island in the Philippines (Coral Bay Project) to produce nickel-cobalt- mixed sulfide from laterite low-grade nickel oxide ore. The total investment in the project was estimated to be \$180 million, which would be equivalent to Sumitomo Metal Mining's 54% interest in the project. The processing plant was scheduled to be completed in August 2004 and commercial production was scheduled to begin in December 2004. Sumitomo Metal Mining was negotiating with Inco Ltd. for participating in the large-scale hydrometallurgical nickel refining process (Goro Bay Project) in New Caledonia. However, a decision was not made by yearend 2003 (Sumitomo Metal Mining Co. Ltd., 2003§, 2004§).

In 2003, domestic demand for refined nickel increased by 6.9% to 69,500 t owing to the continued strong demand by the manufacturers of specialty steel. The consumption of refined nickel by manufacturers of specialty steel increased by 9.7% to 58,400 t, and galvanized sheet by 23.6% to 3,090 t, while that for batteries decreased by 20.1% to 3,180 t; magnetic materials by 7.4% to 1,840 t; catalysts, by 7.0% to 409 t; and other end uses, by 10.5% to 2,560 t (Ministry of Economy, Trade and Industry, 2003c, p. 270).

Exports of refined nickel decreased by 37.7% to 104 t valued at \$1.2 million in 2003. The major buyers were Thailand (29.5%), Indonesia (27.9%), the Philippines (20.0%), China and Hong Kong (8.7% each), and Vietnam (3.1%). Exports of nickel oxide sinter and other intermediate products of nickel metallurgy increased by 20.8% to 27,900 t valued at \$210.9 million. The principal buyers

were Taiwan (48.0%), the Republic of Korea (44.2%), and the United Kingdom (7.0%). Exports of nickel powders and flakes increased by 15.0% to 1,670 t valued at \$33.0 million in 2003. The major buyers were China (69.0%), Hong Kong (13.3%), and France (6.6%). Exports of nickel waste and scrap increased by 110.2% to 648 t valued at \$2.0 million in 2003. The major buyers were the United States (46.4%), China (19.9%), and the United Kingdom (8.4%) (Ministry of Finance, 2003a, p. 574-575).

Titanium.—Japan was the world's second leading producer of titanium sponge metal and accounted for 28.2% of the world total (Arumu Publishing Co. Ltd., 2004, p. 52). Japan also was one of the world's major producers of titanium dioxide pigment. All the raw material requirements for production of titanium sponge metal and titanium dioxide pigment, however, were supplied by imports. Titanium ore (rutile) was consumed by the producers of titanium sponge metal. Ilmenite and titanium slag were consumed mainly by the manufacturers of synthetic rutile and titanium dioxide pigment. Small amounts of rutile and ilmenite were consumed as blast furnace additives in the steel industry.

Imports of titanium ore (rutile) decreased by 6.7% to 88,100 t valued at \$41.3 million because of lower ore requirements for titanium sponge production in 2003. The major suppliers were Australia (57.8%), India (28.1%), South Africa (8.8%), and Canada (5.2%). Imports of ilmenite increased by 26.9% to 369,000 t valued at \$32.8 million. The major suppliers were Vietnam (41.0%), Australia (18.9%), Canada (15.5%), Egypt (13.7%), India (6.1%), and Malaysia (3.4%) (Ministry of Finance, 2003b, p. 170). In 2003, Japan also imported about 102,000 t of titanium slag principally from Canada and South Africa for titanium oxide pigment production (Arumu Publishing Co. Ltd., 2004, p. 97).

According to the Japan Titanium Society (2004, p. 1), production of titanium sponge decreased by 24.9% to 18,900 t in 2003 because of weaker domestic demand and the continued decline in exports to the European Union and other countries except the United States, exports to which grew by 14.9% to 4,540 t in 2003. Total titanium sponge shipments decreased by 17.8% to 18,600 t in 2003. Shipments of titanium sponge to domestic market decreased by 23.2% to 12,900 t. Exports of titanium sponge decreased by 2.4% to 5,710 t. Imports of titanium sponge decreased by 37.9% to 5,720 t. Total shipments of titanium mill products decreased by 4.4% to 13,800 t; domestic shipments of titanium mill products decreased by 6.2% to 6,810 t. Exports of titanium mill products increased by 2.8% to 7,030 t (Arumu Publishing Co. Ltd., 2004, p. 53).

In 2003, Kobe Steel increased its equity in Sumitomo Titanium Corp. to 24.8% from 8.8% in 2002. Under an agreement reached between Kobe Steel and Sumitomo Metal Industries, Kobe Steel would acquire 1.42 million shares of Sumitomo Titanium from Sumitomo Metal Industries. Sumitomo Titanium was the main supplier of titanium sponge to Kobe Steel, which in turn was Japan's leading and only integrated producer of titanium mill products. In November 2002, Kobe Steel and Sumitomo Metal Industries had reached a cooperative agreement for Kobe Steel to supply Sumitomo Metal Industries with hot rolled titanium coil and to cooperate in achieving mutual efficiency and cost reduction with respect to raw materials procurement, production, and distribution in the titanium business (Japan's Corporate News Network, 2003§).

In the domestic market, shipments of titanium mill products to chemical-plant and heat-exchange equipment manufacturers decreased to 2,010 t from 2,200 t in 2002. Shipments to power-generation and water-desalination plant manufacturers decreased to 601 t from 886 t in 2002. Shipments to the distributors increased to 1,260 t from 1,140 t in 2002. Shipments to consumer and sports leisure goods manufacturers decreased to 1,080 t from 1,370 t (revised) in 2002. Shipments to aircraft manufacturers increased to 491 t from 447 t. Shipments to automobile manufacturers increased to 767 t from 571 t in 2002. Shipments to architectural and civil engineering materials manufacturers increased to 166 t from 43 t in 2002. Shipments to the manufacturers of energy, marine, and ship materials decreased to 149 t from 194 t in 2002 (Arumu Publishing Co. Ltd., 2004, p. 57; Japan Titanium Society, 2004, p. 1).

According to Government trade statistics, exports of titanium sponge decreased slightly by 0.5% to 6,000 t valued at \$40.5 million in 2003. The two principal buyers were the United States (76.1%) and the United Kingdom (16.8%) (Ministry of Finance, 2003a, p. 586). To meet domestic requirements, Japan imported 5,720 t of lower grade titanium sponge and powder valued at \$41.8 million. The principal suppliers were Russia (45.4%), Kazakhstan (27.3%), and the United States (19.5%) (Ministry of Finance, 2003b, p. 673).

Imports of titanium mill products decreased to 976 t from 1,390 t in 2002 valued at \$43.0 million. The principal suppliers in 2003 were the United States (49.2%), Russia (38.8%), China (3.6%), and Taiwan (2.0%) (Ministry of Finance, 2003b, p. 673). Exports of titanium mill products increased to 8,800 t valued at 217.4 million from 8,700 t in 2002. The major buyers were Sweden (13.2%), China (14.9%), the Republic of Korea (12.1%), Italy (11.2%), France (8.0%), Germany (7.6%), Taiwan (6.7%), the United States (6.3%), and Hong Kong (5.1%) (Ministry of Finance, 2003a, p. 586-587).

In 2003, production of titanium dioxide increased by 5.4% because of the increased demand in the domestic market and an increase in exports. Shipments of titanium dioxide totaled 256,000 t. The end users, in decreasing order, were paints and coating materials, printing inks and pigments, papers, synthetic resin (plastics), chemical fibers, rubbers, condensers, and others (Ministry of Economy, Trade and Industry, 2003b, p. 60).

Imports of titanium oxide increased by 27.0% to 11,600 t valued at \$15.2 million from 9,110 t in 2002. The major suppliers were China (59.0%), the Republic of Korea (22.4%), and France (14.1%) (Ministry of Finance, 2003b, p. 181-182). Exports of titanium oxides increased by 12.3% to 28,600 t valued at \$80.7 million. The major buyers were China (45.0%), Taiwan (17.2%), the Republic of Korea (9.7%), the United States (4.5%), Indonesia (3.3%), Thailand (2.4%), and the Netherlands (2.2%) (Ministry of Finance, 2003a, p. 113).

Industrial Minerals

Cement.—Japan was one of the world's leading cement producers in 2003. Japan's cement production decreased by 4.3% to 68.8 Mt because of decreased domestic construction activities resulting from reduced public works project budgets that generated about 60% of domestic cement demand. As of April, Japan's cement industry comprised 20 companies, which operated 35 plants with 62 kilns with a total capacity of 78 Mt/yr. Japan's cement plants were concentrated in the Osaka surrounding area in the Kansai (Kinki) region (western Japan), the Tokyo surrounding area in the Kanto region (eastern Japan), and the Fukuoka surrounding area on the Kyushu Island, where most of Japan's limestone reserves are located (Japan Cement Association, 2003§).

As a result of the continued restructuring in the cement industry, Japan's cement clinker capacity in 2003 decreased to 81.36 Mt/yr from 82.9 Mt/yr in 2002, and the number of regular employees in the cement industry decreased to 3,660 from 3,836 in 2002. Production of cement clinker decreased to 66.8 Mt from 68.9 Mt in 2002, and production of cement decreased to 68.8 Mt from 71.8 Mt in 2002. Of the total cement produced in 2003, 52 Mt was portland cement, 48.3 Mt of which was ordinary portland cement, and 3.7 Mt, high early strength and moderate-heat portland cement; 16.0 Mt, blast-furnace slag cement; 582,000 t, other cement; 93,000 t, fly ash cement; and 73,000 t, white cement. The major raw materials consumed by the cement industry included 76.6 Mt of limestone, 9.8 Mt of clay, 6.1 Mt of silica stone, 5.4 Mt of blast furnace ore slag, and 2.5 Mt of gypsum (Ministry of Economy, Trade and Industry, 2003a, p. 66-70, 127-128, 132, 135).

In 2003, total cement shipments decreased by 4.2% to 68 Mt owing to the decrease in the country's construction activities. Exports of cement clinker increased by 18.0% to 4.91 Mt valued at \$88.1 million and exports of portland cement increased by 21.4% to 4.82 Mt valued at \$97.2 million. The major buyers of cement clinker were China (30.3%), Hong Kong (26.1%), Australia (15.4%), Malaysia (9.0%), and Benin (7.4%). The major buyers of portland cement were Singapore (32.7%), Hong Kong (18.6%), the Republic of Korea (16.4%), China (12.4%), Nigeria (9.7%), and Taiwan (7.9%). The average export free-on-board (f.o.b.) price of portland cement increased to \$20.17 per ton from \$19.63 per ton in 2002 (Ministry of Finance, 2003a, p. 100). Imports of portland cement totaled 884,000 t. The Republic of Korea was the dominant supplier and accounted for 98.0%. The average import c.i.f. price of portland cement decreased to \$36.15 per ton from \$42.82 per ton in 2002 (Ministry of Finance, 2003b, p. 167-168).

To meet the growing demand in Hebei Province in China, Taiheiyo Cement Corp. planned to produce ready mixed concrete at a new plant in Hebei Province. Taiheiyo Cement and two local companies had established a manufacturing subsidiary to run the joint-venture plant. Operations were scheduled to begin in November 2003. The new plant was to procure raw materials from the nearby cement plant operated by Taiheiyo Cement (China) Investment Co. Ltd. (International Cement Review, 2003).

Limestone.—Japan was one of the world's top limestone producers in 2003. Production decreased by 3.9% to a new low since 1986 as a result of decreased consumption as a raw material for cement production and as a construction aggregate for public works projects by the construction industry.

Total sales (demand) of domestically produced limestone decreased to 155.5 Mt from 160.1 Mt (revised) in 2002. Demand for domestically produced limestone by end use was for cement (42.4%), concrete (22.2%), ferrous and nonferrous metals smelting (14.3%), roads (5.8%), soda and glass in casting and making refractories (0.6%), and other uses (14.7%) (Ministry of Economy, Trade and Industry, 2003d, p. 136-137).

In 2003, Japan's imports of limestone, limestone flux, and other calcareous stone totaled 397,000 t valued at \$11.2 Mt. The major suppliers were the Philippines (37.7%), Malaysia (32.9%), Vietnam (22.9%), and China (6.1%). Exports of limestone flux, limestone, and other calcareous stone totaled 2.5 Mt valued at \$17.7 million. The major buyers were Taiwan (62.9%), Australia (23.2%), and the Republic of Korea (13.8%) (Ministry of Finance, 2003a, p. 100; 2003b, p. 167).

Mineral Fuels

Coal.—In 2003, Japan relied 100% on imports to meet its annual requirements for coking coal and anthracite, and about 99% to meet its annual requirements for steam (thermal) coal. Japan's coal imports accounted for 22% of total world coal imports in 2003. Japan's major consumers of anthracite and coking coal were the coke, iron and steel, nonferrous metals, cement, and paper industries; and of steam coal, the power generating industries (U.S. Energy Information Administration, 2004§).

Coal was produced mainly by an underground mine operated by Kushiro Coal Mine Co. Ltd. and 11 small-scale open pit mines (10 in Hokkaido Prefecture and 1 in Yamaguchi Prefecture). Kushiro was a center for transferring Japanese coal technology to large-scale coal-producing countries in Asia. Japan produced about 1.37 Mt of coal, of which 763,000 t was produced by Kushiro, and 605,000 t, from the 11 small-scale open pit mines (Tomita, Shinji, Director, Planning Department, Japan Coal Energy Center, written commun., October 16, 2003).

In 2003, Japan's overall coal imports increased by 5.3% to 167.0 Mt valued at \$6.42 billion, of which 107.7 Mt was bituminous coal (steam other than coking coal); 54.4 Mt, coking coal; and 4.9 Mt, anthracite. The major suppliers of coking coal were Australia (64.9%), Canada (15.0%), China (14.2%), and Russia (5.0%); the major suppliers of bituminous coal were Australia (55.1%), Indonesia (19.9%), China (18.9%), and Russia (6.2%); and the major suppliers of anthracite were China (53.3%), Vietnam (33.5%), North Korea (6.7%), and Australia (4.91%). China gained a larger market share in Japan's anthracite coal market by offering lower prices of its anthracite coal (Ministry of Finance, 2003b, p. 171).

Natural Gas and Petroleum.—Japan was one of the world's top importers of natural gas and crude petroleum. Domestic production of natural gas and crude petroleum was insignificant because of the country's limited indigenous oil and gas reserves. Japan's natural gas and crude petroleum reserves were estimated to be 39.6 billion cubic meters and 58.5 million barrels (Mbbbl),

respectively (Oil & Gas Journal, 2003). In 2003, domestic production of natural gas and crude petroleum totaled 2.84 billion cubic meters and 5.16 Mbbl, respectively, which was equivalent to 3.4% and 0.34% of the 83 billion cubic meters and 1.5 billion barrels (Gbb) of domestic consumption of natural gas and crude petroleum, respectively (Ministry of Economy, Trade and Industry, 2003d, p. 24-25, 80, 122).

In 2003, Japan relied on imports to meet 96.6% of its domestic natural gas requirements and 99.66% of its crude petroleum requirements. Japan imported 80.2 billion cubic meters of natural gas in the form of LNG and 1.6 Gbb of crude petroleum (Ministry of Economy, Trade and Industry, 2003d, p. 32-34, 122).

According to the Ministry of Finance (2003b, p. 177) trade statistics, however, imports of LNG totaled 59.1 Mt (88.5 billion cubic meters) valued at \$14.6 billion in 2003. The major suppliers of LNG were Indonesia (30.1%), Malaysia (21.0%), Australia (12.9%), Qatar (11.4%), Brunei (11.1%), and the United Arab Emirates (8.6%). Crude petroleum imports were mainly from the Middle East (87.1%) and Asia (7.6), which included China and Southeast Asia. The major suppliers of crude petroleum were the United Arab Emirates (23.4%), Saudi Arabia (22.8%), Iran (15.9%), Qatar (9.4%), Kuwait (6.9%), Oman (4.3%), Indonesia (3.9%), the Neutral Zone (of Kuwait and Saudi Arabia) (3.7%), and China (1.7%). Imports of crude petroleum were valued at \$45.8 billion (Ministry of Economy, Trade and Industry, 2003d, p. 32-34; Ministry of Finance, 2003b, p. 172-173).

In 2003, refined petroleum products were produced by 18 oil companies that operated 32 refineries with a total capacity of 4.7 million barrels per day. In December 2002, Nippon Mitsubishi Petroleum Refining Co. Ltd. formed a strategic alliance with Idemitsu Kosan Co. Ltd. to reduce costs and coordinate distribution of refined products. As a result, Idemitsu shut down the 80,000-barrel-per-day (bbl/d) Hyogo refinery in April 2003 and its 110,000-bbl/d Okinawa refinery in November (U.S. Energy Information Administration, 2004\$).

In 2003, domestic demand for refined petroleum, by product, was as follows: heavy fuel oil, 389 Mbbl; gasoline, 378 Mbbl; naphtha, 309 Mbbl; diesel (distillate fuel oil), 241 Mbbl; kerosene, 187 Mbbl; jet fuel, 28 Mbbl; asphalt, 24 Mbbl; lubricants, 13 Mbbl; and paraffin wax, 474,000 barrels (bbl). To meet its domestic demand, Japan imported a total of 242 Mbbl of refined petroleum products in 2003. The imported refined petroleum products included 187 Mbbl of naphtha, 20 Mbbl of kerosene, 19 Mbbl of heavy fuel oil, 11 Mbbl of gasoline, 5 Mbbl of diesel, 588,000 bbl of jet fuel, 307,000 bbl of lubricants, and 42,000 bbl of paraffin wax (Ministry of Economy, Trade and Industry, 2003d, p. 84-85).

In 2003, consumption of domestically produced natural gas was by gas (49.0%), electric power (19.2%), oil and gas (13.9%), chemical (12.1%), and other manufacturing and service (5.7%) industries. Additionally, Japan consumed 53.6 Mt (80.3 billion cubic meters) of imported natural gas in the form of LNG for consumption mostly by the electric power industry for power generation (70%) and for gas and industrial use (30%) (Ministry of Economy, Trade and Industry, 2003d, p. 28-29, 122).

At the end of 2003, Japan's stockpile of crude petroleum and partially refined and refined petroleum products totaled 165 days of supply, of which the national stockpile was 87 days, and the private stockpile, 78 days (Ministry of Economy, Trade and Industry, 2003d, p. 152-153).

Reserves

Japan's reserves of limestone and other industrial minerals, such as dolomite, iodine, pyrophyllite, and silica stone, are large. Coal reserves were substantial, but not large, and very costly to produce in Japan. With the exception of gold and zinc, ore reserves for metallic minerals and other minerals, especially oil and gas, are negligible (table 3).

Infrastructure

Japan had one of the most modern and complete infrastructures for its mining and mineral-processing industries in the world. Despite its small land area, Japan had a highway system of 1.16 million kilometers (Mkm), of which 534,000 kilometers (km) was paved, and 627,000 km, unpaved. The railroad network had 23,700 km, of which 20,400 km was 1.067-meter (m) narrow gauge (13,200 km of which was electrified), 3,200 km was 1.435-m standard gauge (all electrified), 77 km was 1.372-m narrow gauge (all electrified), and 11 km was 0.762-m narrow gauge (all electrified). Highway and railroad networks link all major seaports and coastal cities on the four major islands. The networks also connect Honshu to Kyushu and Shikoku Islands in the south and Hokkaido Island in the north by means of bridges and tunnels.

Japan's domestic and international telecommunication services were among the best in the world with land and mobile phone services; satellite earth stations [five Intelsat (four in the Pacific Ocean and one in the Indian Ocean), one Intersputnik (in the Indian Ocean), and one Inmarsat (in the Indian and Pacific Oceans)]; submarine cables to China, the Philippines, Russia, and the United States (via Guam); and 73 Internet service providers (as of 2000). For electric power transmission, Japan had a route length of 94,000 km and a circuit length of 166,000 km (as of 2001). For power distribution, Japan's total length of line distances, which included high- and low-voltage, was 1.23 Mkm (as of 2001) concentrated in the major industrial areas of Fukuoka, Hiroshima, Nagoya, Osaka, Takamatsu, Tokyo, and Toyama. Japan also had an extensive pipeline system comprising 2,719 km for natural gas, 170 km for oil, and 60 km for oil, gas, and water (as of 2003).

Japan had 27 major ports and more than 2,000 minor ports to receive raw materials from overseas and to export manufactured products. The major port facilities, which included terminals and warehouses, were among the most indispensable parts of the infrastructure for the mineral industry because of their role in receiving imported raw materials, such as coal, crude petroleum, iron ore, LNG, nonferrous ore, and phosphate rock for mineral-processing plants and powerplants, as well as exporting value-added

mineral and metal products. The important seaports of the major mineral processing centers were Akita, Amagasaki, Chiba, Hachinohe, Higashi-Harima, Himeji, Hiroshima, Kawasaki, Kobe, Mizushima, Nagoya, Osaka, Sakai, Shimizu, Tokyo, and Yokohama on Honshu (Main Island); Fukuoka, Kita Kyushu, Moji, and Oita on Kyushu Island; Hakodate, Kushiro, Muroran, and Tomakomai on Hokkaido Island; and Sakaide on Shikoku Island.

Japan had 174 airports and 15 heliports in 2003. The major international airports were Fukuoka, Haneda (Tokyo), Kansai, Nagoya, Narita (New Tokyo), and Osaka. Japan's round-the-clock airport, Kansai International, sits on reclaimed offshore land in Osaka Bay.

Outlook

Japan's economic recovery is expected to continue at a faster pace in 2004 and then at a slower pace in 2005. GDP growth was forecasted to increase to 3.4% in 2004 and 1.9% in 2005 (International Monetary Fund, 2004§). Domestic mining activities, especially in the industrial minerals sector, are expected to increase slightly in 2004. Metal production of copper and zinc is expected to increase as domestic demand for the metals continues its upward trend in 2004. Production of crude steel is expected to remain above the 110-Mt level in 2004 because of the continued strong demand in the Japanese automobile and machinery and equipment sectors and anticipated increases in exports to Southeast Asia in 2004. Production of titanium sponge metal is expected to increase in 2004 because of increased exports owing to the recovery of commercial airline business in the United States and Europe. Production of cement and limestone is expected to increase slightly in 2004 owing to increasing construction activities in late 2003 and early 2004.

To sustain its economic health and to prevent another economic recession, Japan is expected to continue exporting more ferrous and nonferrous metals and cement clinker and cement to ASEAN countries, China, the Republic of Korea, and Taiwan, where the economies are expected to continue to improve in the coming years. Imports of coal, nonferrous metals, and other minerals are expected to increase in 2004 when the economic recovery moves to higher gear.

In line with its mineral policy to secure and diversify its long-term supply of raw materials, which will ensure a steady economic growth, Japan is expected to continue its active search for direct investment in joint exploration and development of minerals in developed and developing countries, especially in Australia, Canada, Chile, China, Indonesia, Mexico, Peru, the Philippines, and the United States. The targeted minerals were antimony, chromium, coal, columbium (niobium), copper, gold, iron ore, lead, lithium, manganese, molybdenum, natural gas, nickel, crude petroleum, rare earths, silver, strontium, tantalum, titanium, tungsten, vanadium, and zinc.

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TABLE 1
JAPAN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003 ^p
METALS						
Aluminum:						
Alumina	thousand tons	335	369	331	333	330 ^e
Aluminum hydroxide	do.	737	782	739	724	740 ^e
Metal:						
Primary:						
Regular grades	do.	11	7	7	6	6 ^e
High-purity	do.	35	41	27	40	44
Secondary ²	do.	1,158	1,214	1,171	1,239	1,200 ^e
Antimony:						
Oxide		10,348	11,051	8,789	9,052	8,235
Metal		178	146	101	183	121
Arsenic, high-purity ^c		110	100	100	100	100
Bismuth		481	520	551	474	513
Cadmium, refined		2,567	2,472	2,460	2,444	2,509
Chromium, metal ^c		700	750	1,350	1,600	1,500
Cobalt, metal		247	311	350	354	379
Copper:						
Mine output, Cu content		1,038	1,211	744	--	--
Metal:						
Blister and anode:						
Primary		1,256,276	1,331,352	1,328,489	1,317,291	1,343,353
Secondary		133,188	149,282	139,764	182,069	172,724
Total		1,389,464	1,480,634	1,468,253	1,499,360	1,516,077
Refined:						
Primary		1,215,248	1,290,091	1,287,165	1,211,111	1,251,728
Secondary		126,301	147,260	138,526	189,968	178,637
Total		1,341,549	1,437,351	1,425,691	1,401,079	1,430,365
Gallium, metal:						
Primary ^c		12	14	8	8	9
Secondary		47	56	62 ^r	80 ^r	83
Germanium:						
Oxide ^c		10	10	10	10	10
Metal	kilograms	765	1,809	1,615	803	621
Gold:						
Mine output, Au content	do.	9,405	8,400	7,815	8,615	8,143
Metal:						
Primary	do.	147,719	146,061	155,826	144,748	161,399
Secondary ³	do.	20,107	19,280	19,831	21,160 ^r	22,549
Total	do.	167,826	165,341	175,657	165,908 ^r	183,948
Indium, metal	do.	40,465	55,078	55,000 ^e	60,000 ^r	70,000
Iron and steel:						
Iron ore and iron sand concentrate:						
Gross weight		1,450	1,454	750	700 ^e	700 ^e
Fe content		589	523	258	240 ^e	240 ^e

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003 ^p
METALS--Continued						
Iron and steel--Continued:						
Metal:						
Pig iron and blast furnace ferroalloys	thousand tons	74,520	81,071	78,836	80,979	82,091
Electric-furnace ferroalloys:						
Ferrochrome		119,777	130,074	111,167	91,937	19,427
Ferromanganese		315,152	337,694	368,293	356,717	371,831
Ferronickel		332,293	367,181	367,739	370,973	369,099
Ferrosilicon		1,452	--	--	--	--
Silicomanganese		65,744	67,926	62,238	70,965	58,043
Other:						
Ferromolybdenum		3,391	3,699	3,485	2,375	2,691
Ferrotungsten		43	42	109	9	12
Ferrovandium		3,349	4,108	3,613	3,592	3,491
Unspecified		6,077	7,171	5,733	6,376	3,813
Total		847,278	917,895	922,377	902,944	828,407
Steel, crude	thousand tons	94,192	106,444	102,866	107,745	110,511
Semimanufactures, hot-rolled:						
Ordinary steels	do.	73,221	83,044 ^r	78,927	80,838 ^r	81,769
Special steels	do.	14,224	15,747	15,835	17,451 ^r	18,735
Lead:						
Mine output, Pb content		6,074	8,835	4,997	5,723	5,660
Metal, refined:						
Primary		125,514	129,469	127,358	107,744	105,460
Secondary		167,915	182,209	175,088	178,016	189,831
Total		293,429	311,678	302,446	285,760	295,291
Magnesium, metal, secondary ^c		7,732 ⁴	10,000	10,000	9,000	10,000
Manganese, oxide		57,993	63,379	51,095	45,867	49,115
Molybdenum, metal		586	626	610	465	561
Nickel metal:						
Refined		30,481	36,230	32,526	32,303	34,991
Ni content of nickel oxide sinter		34,482	47,020	49,600	48,950	52,700
Ni content of ferronickel		67,166	74,753	68,113	74,418	74,804
Ni content of chemical		2,570	2,721	2,394	1,820	2,084
Total		134,699	160,724	152,633	157,491	164,579
Platinum-group metals:						
Palladium, metal	kilograms	5,354	4,712	4,805	5,618	5,500 ^e
Platinum, metal	do.	737	782	791	762	770 ^e
Rare-earth oxides ⁵		5,092	5,619	5,109	5,423	5,521
Selenium, metal		546	612	735	752	734
Silicon, high-purity		3,844	4,688	4,334	4,457	5,045
Silver:						
Mine output, Ag content	kilograms	94,004	103,781	80,397	81,416	78,862
Metal:						
Primary	do.	2,257,888	2,384,739	2,293,028	2,259,551	2,453,204
Secondary ³	do.	503,938	345,358	303,804	291,955 ^r	258,754
Total	do.	2,761,826	2,730,097	2,596,832	2,551,506 ^r	2,711,958
Tantalum, metal ^c		85	85	90	90	95
Tellurium, metal		35	36	39	29	33
Tin, metal, smelter		568	593	668	659	662

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1999	2000	2001	2002	2003 ^p
METALS--Continued					
Titanium:					
Dioxide	269,193	270,272	256,961	240,469	253,453
Metal	18,928 ^r	19,457 ^r	24,906 ^r	25,199 ^r	18,923
Tungsten, metal	4,357	4,993	3,607	3,302	3,333
Vanadium, metal ^{c, 6}	250	250	250	250	250
Zinc:					
Mine output, Zn content	64,263	63,601	44,519	42,851	44,574
Oxide	78,928	82,816	75,414	74,515	75,090
Metal:					
Primary	524,979	541,704	541,277	547,183	532,704
Secondary	158,637	157,047	142,777	126,723	153,411
Total	683,616	698,751	684,054	673,906	686,115
Zirconium, oxide	7,660	8,540	7,930	8,650 ^r	8,800 ^e
INDUSTRIAL MINERALS					
Asbestos ^c	18,000	18,000	18,000	18,000	18,000
Bromine ^c	15,000	15,000	15,000	20,000	20,000
Cement, hydraulic	thousand tons	80,120	81,097	76,550	71,828
Clays:					
Bentonite	428,247	415,115	405,738	437,772 ^r	425,945 ^e
Fire clay, crude	558,110	506,314	475,665	480,000 ^e	460,000 ^e
Kaolin	53,092	25,739	19,976	11,756 ^r	12,409
Diatomite ^c	190,000	190,000	180,000	180,000	185,000
Feldspar and related materials: ^c					
Feldspar	52,000	52,000	50,000	50,000	50,000
Aplite	330,000	330,000	310,000	403,000 ^r	300,000
Gypsum	thousand tons	5,549	5,917	5,874	5,644
Iodine	6,152	6,157	6,643	6,548	6,524
Lime, quicklime	thousand tons	7,594	8,106	7,586	7,420
Nitrogen, N content of ammonia	do.	1,385	1,410	1,318	1,192
Perlite ^c	260,000	250,000	255,000	250,000	250,000
Salt, all types	thousand tons	1,327	1,374	1,358	1,282 ^r
Silica sand	do.	6,088	6,121	5,768	4,893 ^r
Sodium compounds, n.e.s.:					
Soda ash	721,752	669,203	461,204	410,000 ^r	400,000 ^e
Sulfate, anhydrous	174,139	163,057	146,780	137,713	132,807
Stone, crushed:					
Dolomite	thousand tons	3,648	3,539	3,389	3,450
Limestone	do.	180,193	185,569	182,255	170,166 ^r
Stone, quartzite	do.	15,548	15,578	14,213	13,568 ^r
Sulfur:					
S content of pyrite	do.	41	30	30	20
Byproduct of metallurgy	do.	1,363	1,384	1,319	1,326
Byproduct of petroleum	do.	2,054	2,071	2,024	1,865
Talc and related materials:					
Talc ^c	50,000	50,000	45,000	40,000	40,000
Pyrophyllite	694,317	692,998	623,097	600,000 ^e	600,000 ^e
Vermiculite ^c	15,000	15,000	15,000	15,000	15,000

See footnotes at end of table.

TABLE 1--Continued
JAPAN: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1999	2000	2001	2002	2003 ^p
MINERAL FUELS AND RELATED MATERIALS					
Carbon black thousand tons	761	788	742	755	788
Coal, bituminous ⁷ do.	3,906	3,126	3,198	1,367	1,400 ^e
Coke including breeze, metallurgical do.	36,473	38,394	38,402	38,417	38,544
Gas, natural:					
Gross ⁸ million cubic meters	2,280	2,453	2,521	2,571	2,844
Marketed do.	2,362	2,507	2,602	2,662	3,011
Petroleum:					
Crude thousand 42-gallon barrels	4,592	4,656	4,782	4,548	5,161
Refinery products:					
Gasoline:					
Aviation ^e do.	104	45	40	40	50
Other do.	353,730	356,530	364,714	364,129	367,687
Asphalt and bitumen do.	33,909 ^r	33,366 ^r	33,151 ^r	31,537 ^r	32,586
Distillate fuel oil do.	280,122	268,022	261,851	250,932	242,311
Jet fuel do.	65,732	66,828	67,320	65,263	60,013
Kerosene do.	167,744	175,399	176,655	169,472	177,963
Liquefied petroleum gas do.	56,504 ^r	57,251 ^r	59,942 ^r	53,593 ^r	53,107
Lubricants do.	16,939	16,677	16,304	16,630	16,314
Naphtha do.	113,080	112,935	116,122	119,298	122,355
Paraffin, wax do.	860 ^r	855 ^r	822 ^r	833 ^r	915
Petroleum coke do.	3,710	4,274 ^r	4,700	4,549 ^r	4,000
Refinery fuel and losses ^{e, 9} do.	150,000	150,000	150,000	150,000	150,000
Residual fuel oil do.	435,916	429,153	409,780	398,673	435,763
Unfinished oils ^e do.	50,000	50,000	50,000	50,000	50,000
Total ¹⁰ do.	1,730,000	1,720,000	1,710,000	1,670,000	1,710,000

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^pPreliminary. ^rRevised. -- Zero.

¹Table includes data available through October 27, 2004.

²Includes unalloyed and alloyed ingot.

³Includes recovered from scrap and waste.

⁴Reported figure.

⁵Includes oxide of cerium, europium, gadolinium, lanthanum, neodymium, praseodymium, samarium, terbium, and yttrium.

⁶Represents metal content of vanadium pentoxide recovered from petroleum residues, ashes, and spent catalysts.

⁷Includes small amount of anthracite in 1998-2001. All major coal mines had closed by January 2002, but 12 smaller mines were still in operation in 2003.

⁸Includes output from gas wells and coal mines.

⁹May include some additional unfinished oils.

¹⁰Data are rounded to three significant digits; may not add to totals shown.

Sources: Ministry of Economy, Trade and Industry—Yearbook of Iron and Steel, Non-ferrous Metal, and Fabricated Metals Statistics, 2003; Yearbook of Chemical Industries Statistics, 2003; Yearbook of Ceramics and Building Materials Statistics, 2003; and Yearbook of Mineral Resources and Petroleum Products Statistics, 2003. Japan Aluminum Association—Aluminum Statistics, 2003. Arumu Publishing Co. Ltd.—Industrial Rare Metals Annual Review No. 120, 2004.

TABLE 2
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Aso Cement Co. Ltd.	Tagawa and Kanda, Fukuoka Prefecture	2,400
Do.		Daiichi Cement Co. Ltd.	Kawasaki, Kanagawa Prefecture	1,169
Do.		Denki Kagaku K.K.	Omi, Niigata Prefecture	2,762
Do.		Hachinohe Cement Co. Ltd.	Hachinohe, Aomori Prefecture	1,533
Do.		Hitachi Cement Co. Ltd.	Hitachi, Ibaraki Prefecture	941
Do.		Mitsubishi Materials Corp.	Higashidori, Shimokita-gun, Aomori Prefecture; Higashiyama, Higashiiwai-gun, Iwate Prefecture; Yokoze, Saitama Prefecture; Kurosaki, Kyushu, and Higashitani, Fukuoka Prefecture	13,467
Do.		Mitsui Mining Co. Ltd.	Togawa, Fukuoka Prefecture	2,075
Do.		Myojo Cement Co. Ltd.	Itoigawa, Niigata Prefecture	2,482
Do.		Nippon Steel Chemical Co. Ltd.	Tobata, Kitakyushu, Fukuoka Prefecture	855
Do.		Nittetsu Cement Co. Ltd.	Muroran, Hokkaido Prefecture	1,589
Do.		Ryukyu Cement Co. Ltd.	Yabu, Nago, Okinawa Prefecture	722
Do.		Sumitomo Osaka Cement Co. Ltd.	Tamura, Fukushima Prefecture; Aso, Tochigi Prefecture; Motosu, Gifu Prefecture; Sakata, Shiga Prefecture; Ako, Hyogo Prefecture; and Susaki, Kochi Prefecture	14,402
Do.		Taiheiyo Cement Corp.	Ofunato, Iwate Prefecture; Chichibu, Kumagaya, and Saitama, Saitama Prefecture; Fujiwara, Mie Prefecture; Saiki and Tsukumi, Oita Prefecture; Kamiiso, Hokkaido Prefecture; Tosa, Kochi Prefecture; and Kawara, Fukuoka Prefecture	29,904
Do.		Tokuyama Cement Co. Ltd.	Nanyo, Yamaguchi Prefecture	5,936
Do.		Tosoh Corp.	Shin Nanyo, Yamaguchi Prefecture	2,869
Do.		Tsuruga Cement Co. Ltd.	Tsuruga, Fukui Prefecture	1,710
Do.		Ube Industries Ltd.	Ube, Isa, Yamaguchi Prefecture; and Kanda, Fukuoka Prefecture	10,736
Coal		Kushiro Coal Mine Co. Ltd. ¹	Kushiro, Hokkaido Prefecture	800
Cobalt, refined	metric tons	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	600
Copper, refined	do.	Hibi Kyodo Smelting Co. Ltd. (Mitsui Mining and Smelting Co. Ltd., 64%; Nittetsu Mining Co. Ltd., 20%; and Furukawa Co. Ltd., 16%)	Tamano, Okayama Prefecture	218,400
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	225,600
Do.	do.	Nippon Mining and Metals Co. Ltd. (wholly owned subsidiary of Nikko Kyodo Co. Ltd.)	Hitachi, Ibaraki Prefecture; Saganoseki, Oita Prefecture	452,400
Do.	do.	Onahama Smelting and Refining Co. Ltd. (Dowa Mining Co. Ltd., 31.15%; Furukawa Co. Ltd., 8.31%; Furukawa Electric Co. Ltd., 4.17%; Mitsubishi Materials Corp., 49.29%; Mitsubishi Cable Industries, Ltd., 4.17%; and others, 2.91%)	Onahama, Fukushima Prefecture	258,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Besshi/Toyo (Saijyo), Ehime Prefecture	300,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	72,000
Gold:				
In concentrate	kilograms	Sumitomo Metal Mining Co. Ltd.	Hishikari, Kagoshima Prefecture	9,000
Refined	do.	Kosaka Smelting and Refining Co. Ltd. (wholly owned subsidiary of Dowa Mining Co. Ltd.)	Kosaka, Akita Prefecture	24,000
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	22,000
Do.	do.	Mitsubishi Materials Corp.	Naoshima, Kagawa Prefecture	60,000
Do.	do.	Nippon Mining and Metals Co. Ltd.	Hitachi, Ibaraki Prefecture	30,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	36,000

See footnotes at end of table.

TABLE 2--Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Limestone		Mitsubishi Materials Corp.	Higashitani, Fukuoka Prefecture	10,000
Do.		Nittetsu Mining Co. Ltd.	Torigatayama, Kochi Prefecture; Hanezuru, Tochigi Prefecture; and Shiriya, Aomori Prefecture	23,000
Do.		Sumikin Mining Co., Ltd.	Hachinohe Sekkai, Aomori Prefecture	5,500
Do.		Sumitomo-Osaka Cement Co. Ltd.	Ibuku, Shiga Prefecture, and Karazawa, Tochigi Prefecture	4,000
Do.		Shuho Mining Co., Ltd.	Sumitomo Cement Shuho, Yamaguchi Prefecture	8,200
Do.		Taiheiyo Cement Co. Ltd.	Ofunato, Iwate Prefecture; Ganji and Tsukumi, Oita Prefecture; Garo, Hokkaido Prefecture; Kawara, Fukuoka Prefecture, Tosayama, Kochi Prefecture; Taiheiyo Buko, Saitama Prefecture; and Shigeyasu, Yamaguchi Prefecture	46,000
Do.		Todaka Mining Co. Ltd.	Todaka-Tsukumi, Oita Prefecture	12,000
Do.		Ube Kosan Co. Ltd.	Ube Isa, Yamaguchi Prefecture	9,000
Iodine, crude	metric tons	Ise Chemical Industries Co. Ltd. (Asahi Glass Co. Ltd., 52.4%; and Mitsubishi Corp., 11.2%)	Oami-Shirasato, and Ichinomya, Chiba Prefecture; and Sadowara, Miyazaki Prefecture	3,600
Do.	do.	Godo Shigen Sangyo Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 11%; and Mitsui & Co. Ltd., 10%)	Chosei, Chiba Prefecture	2,400
Do.	do.	Kanto Natural Gas Development Co. Ltd. (Mitsui Chemicals, Inc., 21.9%; and Godo Shigen Sangyo Co. Ltd., 14.3%)	Mobara, Chiba Prefecture	1,200
Do.	do.	Nihon Tennen Gas Co. Ltd. (Kanto Natural Gas Development Co. Ltd., 50%; and Tomen Corp., 41%)	Shirako and Yokoshiba, Chiba Prefecture	1,200
Do.	do.	Toho Earthtech, Inc. (Itochi Corp., 34.1%; Mitsubishi Gas Chemical Co. Ltd., 32.2%; and Nippon Light Metal Co. Ltd., 31.1%)	Kurosaki, Niigata Prefecture	720
Do.	do.	Nippoh Chemicals Co. Ltd. (Nippon Shokubai Co. Ltd., 17%; Takeda Chemical Industries Ltd., 16.4%; and Chugai Boyeki Co. Ltd., 13.6%)	Isumi, Chiba Prefecture	720
Lead:				
In concentrate		Toyoha Mining Co. Ltd. (wholly owned subsidiary of Nippon Mining and Metals Co. Ltd.)	Toyoha, Hokkaido Prefecture	6
Refined	metric tons	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	33,600
Do.	do.	Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	43,800
Do.	do.	Toho Zinc Co. Ltd.	Chigirishima, Hiroshima Prefecture	120,000
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Harima, Hyogo Prefecture	30,000
Do.	do.	Kosaka Smelting and Refining Co. Ltd.	Kosaka, Akita Prefecture	25,200
Do.	do.	Hosokura Smelting and Refining Mining Co. Ltd. (wholly owned subsidiary of Mitsubishi Materials Corp.) ²	Hosokura, Miyagi Prefecture	21,600
Manganese, electrolytic dioxide		Mitsui Mining and Smelting Co. Ltd.	Takehara, Hiroshima Prefecture	24
Do.		Tosoh Corp.	Hyuga, Miyazaki Prefecture	34

See footnotes at end of table.

TABLE 2--Continued
JAPAN: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Nickel:				
In ferronickel	metric tons	Hyuga Smelting Co. Ltd. (wholly owned subsidiary of Sumitomo Metal Mining Co. Ltd.)	Hyuga, Miyazaki Prefecture	21,000
Do.	do.	Nippon Yakin Kogyo Co. Ltd.	Oheyama, Kyoto Prefecture	12,720
Do.	do.	Pacific Metals Co. Ltd.	Hachinohe, Aomori Prefecture	40,800
In oxide	do.	Tokyo Nickel Co. Ltd.	Matsuzaka, Mie Prefecture	60,000
Refined	do.	Sumitomo Metal Mining Co. Ltd.	Niihama, Ehime Prefecture	36,000
Pyrophyllite		Goto Kozan Co. Ltd.	Goto, Nagasaki Prefecture	204
Do.		Ohira Kozan Co. Ltd.	Ohira, Okayama Prefecture	132
Do.		Sankin Kogyo Co. Ltd.	Otsue, Hiroshima Prefecture	72
Do.		Shinagawa Shirenga Co. Ltd.	Mitsuishi, Okayama Prefecture	180
Do.		Shokozan Kogyosho Co. Ltd.	Yano-Shokozan, Hiroshima Prefecture	180
Do.		Showa Kogyo Co. Ltd.	Showa-Shokozan, Hiroshima Prefecture	60
Steel, crude		JFE Steel Corp. (wholly owned subsidiary of JFE Holdings Inc.)	Chiba, Chiba Prefecture; Kawasaki (Keihin), Kanagawa Prefecture; Nishinomiya, Hyogo Prefecture; Handa Aichi Prefecture; Fukuyama, Hiroshima Prefecture; and Kurashiki, Okayama Prefecture	33,835
Do.		Kobe Steel Ltd.	Kakogawa and Kobe, Hyogo Prefecture	8,943
Do.		Nippon Steel Corp.	Oita, Oita Prefecture; Kawata, Fukuoka Prefecture; Kimitsu, Chiba Prefecture; and Nagoya, Aichi Prefecture	33,199
Do.		Sumitomo Metal Industries, Ltd.	Kashima, Ibaraki Prefecture; Kokura, Fukuoka Prefecture; and Wakayama, Wakayama Prefecture	12,820
Titanium:				
In sponge metal		Sumitomo Titanium Corp. (Sumitomo Metal Industries Ltd., 75.2%; and Kobe Steel Ltd., 24.8%)	Amagasaki, Hyogo Prefecture	18
Do.		Toho Titanium Co. Ltd. (Nippon Mining and Metals Co. Ltd., 47%; Mitsui & Co. Ltd., 20%; and others, 33%)	Chigasaki, Kanagawa Prefecture	13
In dioxide	metric tons	Fuji Titanium Industry Co. Ltd. (Ishihara Sangyo Kaishia Ltd., 24.8%; and others, 75.2%)	Kobe, Hyogo Prefecture	17,400
Do.	do.	Furukawa Co. Ltd.	Osaka, Osaka Prefecture	13,200
Do.	do.	Ishihara Sangyo Kaisha Ltd.	Yokkaichi, Mie Prefecture	154,800
Do.	do.	Sakai Chemical Industries Co. Ltd.	Onahama, Fukushima Prefecture	60,000
Do.	do.	Tayca Corp.	Saidaiji, Okayama Prefecture	60,000
Do.	do.	Titan Kogyo Kabushiki Kaisha	Ube, Yamaguchi Prefecture	16,800
Do.	do.	Tohkem Products Corp.	Akita, Akita Prefecture	30,000
Zinc:				
In concentrate		Toyoha Mining Co. Ltd.	Toyoha, Hokkaido Prefecture	45
Refined	metric tons	Akita Smelting Co. Ltd. (Dowa Mining Co. Ltd., 57%; Nippon Mining and Metals Co. Ltd., 24%; Sumitomo Metal Mining Co. Ltd., 14%; and Mitsubishi Materials Corp., 5%)	Iijima, Akita Prefecture	200,400
Do.	do.	Hachinohe Smelting Co. Ltd. (Mitsui Mining and Smelting Co. Ltd., 57.7%; Nippon Mining and Metals Co. Ltd., 27.8%; and Toho Zinc Co. Ltd. and Nisso Smelting Co. Ltd., 14.5%)	Hachinohe, Aomori Prefecture	117,600
Do.	do.	Hikoshima Smelting Co. Ltd.	Hikoshima, Yamaguchi Prefecture	84,000
Do.	do.	Kamioka Mining and Smelting Co. Ltd.	Kamioka, Gifu Prefecture	72,000
Do.	do.	Toho Zinc Co. Ltd.	Annaka, Gunma Prefecture	139,200
Do.	do.	Sumitomo Metal Mining Co. Ltd.	Harima, Hyogo Prefecture	90,000

¹Coal mining operation continued, following establishment of Kushiho Coal Mining Co. Ltd. in 2002.

²Mitsubishi Materials Corp. suspended operations of its secondary lead smelter at Hosokura in June 2002.

TABLE 3
JAPAN: RESERVES OF MAJOR MINERAL COMMODITIES IN 2003

(Thousand metric tons unless otherwise specified)

Commodity	Reserves
Coal ¹	785,000
Copper ore, Cu content	36
Dolomite ²	1,400,000
Gold ore, Au content kilograms	179,000
Iodine	5,000 ^c
Lead ore, Pb content	623
Kaolin	35,000
Limestone ³	60,700,000
Pyrophyllite	160,000
Silica sand ⁴	201,000
Silica stone, white ⁵	881,000
Silver ore, Ag content	2,390
Zinc ore, Zn content	3,250

^cEstimated.

¹Recoverable reserves, including 17 million metric tons of lignite.

²Average ore grade is 17.9% MgO.

³Average ore grade is 53.8% CaO.

⁴Average ore grade is 78.0% SiO₂.

⁵Average ore grade is 92.8% SiO₂.

Source: Research Institute of Economy, Trade and Industry.

TABLE 4
JAPAN: MINERALS TRADE ¹

(Million dollars)

Code	Commodity	Imports			Exports		
		2001	2002	2003	2001	2002	2003
25	Salt, sulfur, earths and stone, lime, plastering materials, cement	1,345	1,176	1,220	286	301	374
26	Ferrous and nonferrous metal ores, slag, ash	6,486	6,511	7,482	29	30	40
27	Mineral fuels, mineral oils, and products of their distillation; bituminous substances; mineral waxes	70,368	65,664	81,054	1,508	1,403	1,555
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements, or of isotopes	2,941	2,942	3,458	1,814	1,934	2,292
31	Fertilizers	482	526	530	81	84	86
68	Articles of stone, plaster, cement, asbestos, mica, or similar materials	1,062	1,085	1,150	831	855	1,016
69	Ceramic products	643	647	760	1,100	860	912
70	Glass and glassware	1,218	1,202	1,362	2,326	2,413	2,788
71	Natural or cultured pearls; precious or semiprecious stones; precious metals, metals clad with precious metals and articles thereof; imitation jewellery; coins	5,937	5,698	5,705	1,698	1,636	2,149
72	Iron and steel	2,481	2,185	3,093	11,159	13,160	15,717
73	Articles of iron and steel	2,363	2,455	2,852	5,708	5,821	6,225
74	Copper and articles thereof	812	692	761	2,247	2,270	2,388
75	Nickel and articles thereof	905	927	1,384	311	324	458
76	Aluminum and articles thereof	4,879	4,533	5,447	1,323	1,434	1,722
78	Lead and articles thereof	36	19	18	9	20	18
79	Zinc and articles thereof	89	41	63	88	107	89
80	Tin and articles thereof	115	113	156	46	53	56
81	Other base metals, cermet, articles thereof	766	622	840	619	540	643
Total		102,928	97,038	117,335	31,183	33,245	38,528
Total trade		349,099	337,550	382,761	403,121	416,538	470,650

¹Values have been converted from Japanese yen (¥) to U.S. dollars at a rate of ¥121.5=US\$1.00 for 2001, ¥125.4=US\$1.00 for 2002, and ¥115.9=US\$1.00 for 2003.

Source: Ministry of Finance, Japan Exports & Imports, Commodity by Country, December 2001-03.

TABLE 5
JAPAN: OVERSEAS ALUMINUM SMELTING PROJECTS IN 2003

Company/project name and country	Annual capacity (metric tons)		Type of power	Production started	Shipment to Japan started	Major equity holder and/or other holders	Participating Japanese companies and their equity share
	Total	Japanese share					
New Zealand Aluminium Smelters Ltd., New Zealand	313,000	67,600	Hydro	April 1971	July 1971	Comalco New Zealand Ltd., 79.36%	Sumitomo Chemical Co. Ltd., 20.64%.
Alcan Smelters and Chemical Ltd., Canada	90,000	45,000	do.	NA	January 1977	Alcan Aluminum Ltd. of Canada, 50%	Nippon Light Metal Co. Ltd., 50%.
Intalco Aluminum Corp., ¹ United States	272,000	106,000	do.	1966	NA	Alcoa Inc., 61%	Mitsui & Co., Ltd., 32%; and YKK Corp., 7%.
Eastalco Aluminum Co., ¹ United States	174,000	68,000	Thermal	1970	do.	do.	do.
Industria Venezolana de Aluminio C.A., Venezuela	450,000	90,000	Hydro	February 1978	December 1978	Corp. Venezolana de Guayana (CVG) of Venezuela, 80%	Showa Denko K.K., 7%; Sumitomo Chemical Co. Ltd., 4%; Kobe Steel Ltd., 4%; Mitsubishi Materials Corp., 3%; Mitsubishi Aluminum Co. Ltd., 1%; and Marubeni Corp., 1%.
P.T. Indonesia Asahan Aluminium, Indonesia	225,000	133,000	do.	February 1982	October 1982	Indonesian Government, 41%	Nippon Asahan Aluminium Co. Ltd. (a 13-member Japanese consortium), 59%.
Boyne Island Smelter Ltd., reduction lines 1, 2, Australia	260,000	130,000	Thermal	do.	July 1982	Comalco Ltd. of Australia, 59.5%	Sumitomo Light Metal Co. Ltd., 17%; Ryowa Development Pty. Ltd., 9.5%; YKK Aluminum Pty. Ltd., 9.5%; and Sumitomo Chemical Co. Ltd., 4.5%.
Boyne Island Smelter Ltd., reduction line 3, Australia	230,000	94,000	do.	July 1997	October 1997	Comalco Ltd. of Australia, 59.25%	Sumitomo Light Metal No. 2 Co. Pty. Ltd., 17%; Ryowa Development II Pty. Ltd., 14.25%; and YKK Aluminium Pty. Ltd., 9.5%.
Alcoa of Australia Ltd., Australia	350,000	80,500	do.	November 1986	NA	Alcoa of Australia, 45%; Eastern Aluminum Co., 10%; China International Trust & Investment Corp., 22%	Marubeni Corp., 23%.
Aluminio Brasileiro S.A., Brazil	400,000	196,000	Hydro	July 1985	November 1986	Companhia Vale do Rio Doce, 51%	Nippon Amazon Aluminum Co. (a 32-member Japanese consortium), 49%.
Mozambique Aluminum Co., ² Mozambique	250,000	63,000	do.	June 2000	NA	Billiton plc, 47.11%; Industrial Development Corp. of South Africa, 24.04%; Government of Mozambique, 3.85%	Mitsubishi Corp., 25%.
Aluminerie Alouette Inc., ³ Canada	243,000	46,000	do.	June 1992	September 1992	Alcan, 40%; Austria Metal AG, 20%; Hydro Aluminium, 20%; Societe Generale de Financement du Duebec, 13.33%	Marubeni Corp., 6.67%.

NA not available.

¹The two smelters under Intalco Aluminum Corp. and Eastalco Aluminum Co. were acquired by Alcoa Inc. in July 1998.

²Phase 2 will add an additional 253,000 metric tons per year (t/yr) of aluminum capacity by 2003.

³Capacity will be expanded to 500,000 t/yr in fall 2005 from 243,000 t/yr.

Sources: Japan Aluminum Association, Japan Overseas Aluminum Smelting Projects; U.S. Geological Survey, Primary Aluminum Plants Worldwide—1998, Part I—Detail, p. 4, 22, and 155; Marubeni Corp.

TABLE 6
JAPAN: DEMAND FOR GOLD AND SILVER

Item		1999	2000	2001	2002	2003
Gold:						
Dental and medical	kilograms	19,856	21,221	20,813	21,765	22,373
Electrical, electronic, and communication	do.	82,485	106,086	70,916	80,415	85,112
Gold plating	do.	24,153	24,993	22,615	22,513	23,512
Jewelry	do.	45,042	43,119	37,512	37,128	20,489
Decorations and badges	do.	1,623	1,678	1,474	1,392	1,499
Pottery and porcelain	do.	1,210	1,005	975	1,149	1,532
Fountain pens	do.	15	12	14	15	15
Watches	do.	712	768	778	785	790
Industrial arts and crafts	do.	4,112	4,222	4,893	4,697	4,879
Private hoarding	do.	110,712	52,417	69,586	85,569	79,481
Other	do.	47,157	39,257	32,919	47,755	48,317
Total	do.	337,077	294,778	262,495	303,183	287,999
Silver:						
Silver nitrate for photography	metric tons	1,633	1,726	1,663	1,531	1,364
Silver nitrate for other uses	do.	274	335	150	219	295
Electrical contacts	do.	199	313	202	152	218
Brazing alloy	do.	139	139	111	98	94
Electroplating	do.	76	--	--	--	--
Rolled products	do.	155	298	193	216	228
Jewelry and silverware	do.	50	--	--	--	--
Other	do.	569	1,215	636	455	474
Total	do.	3,095	4,026	2,955	2,671	2,673

Source: Arumu Publishing Co. Ltd., Industrial Rare Metals Annual Reviews, nos. 118, 119, and 120.

TABLE 7
JAPAN: DOMESTIC ORDERS FOR ORDINARY AND SPECIALTY STEEL PRODUCTS, BY END USE

(Thousand metric tons)

End use	1999	2000	2001	2002	2003
Automobiles:					
Ordinary steel	8,211	9,310	9,430	10,310	10,580
Specialty steel	2,363	2,660	2,590	2,990	3,230
Total	10,574	11,970	12,020	13,300	13,810
Construction:					
Ordinary steel	13,360	14,060	13,550	13,580	13,300
Specialty steel	714	780	720	640	710
Total	14,074	14,840	14,270	14,220	14,010
Conversion and processing:					
Ordinary steel	3,079	3,090	2,910	2,790	2,760
Specialty steel	3,092	3,400	3,260	3,560	3,880
Total	6,171	6,490	6,170	6,350	6,640
Electric machinery and equipment:					
Ordinary steel	1,954	2,190	1,940	1,840	1,940
Specialty steel	108	140	130	130	160
Total	2,062	2,330	2,070	1,970	2,100
Home and office appliances:					
Ordinary steel	522	610	550	540	580
Specialty steel	175	200	210	200	200
Total	697	810	760	740	780
Industrial machinery and equipment:					
Ordinary steel	1,171	1,330	1,290	1,360	1,650
Specialty steel	996	1,070	940	980	1,180
Total	2,167	2,400	2,230	2,340	3,830
Shipbuilding and marine equipment:					
Ordinary steel	2,881	3,130	3,480	3,420	3,530
Specialty steel	69	120	140	180	210
Total	2,950	3,250	3,620	3,600	3,740
Steel dealers:					
Ordinary steel	18,099	20,030	17,930	17,480	17,070
Specialty steel	1,077	1,280	1,230	1,210	1,350
Total	19,176	21,310	19,160	18,690	18,420
Tanks and containers:					
Ordinary steel	1,750	1,740	1,620	1,560	1,600
Specialty steel	13	20	20	20	20
Total	1,763	1,760	1,640	1,580	1,620
Other:					
Ordinary steel	488	610	570	500	410
Specialty steel	108	110	110	110	120
Total	596	720	680	610	530
Total domestic demand:					
Ordinary steel	51,510	56,100	53,270	53,380	53,420
Specialty steel	8,715	9,780	9,350	10,020	11,060
Grand total	60,225	65,880	62,620	63,400	64,480

Source: The Steel Industry of Japan 2002-2004, The Japan Iron and Steel Federation.

TABLE 8
JAPAN: EXPORTS OF IRON AND STEEL PRODUCTS, BY COUNTRY OF DESTINATION

(Thousand metric tons)

Destinations	1999	2000	2001	2002	2003
Asia:	20,729	22,405	23,037	30,339	29,093
China	2,960	4,062	4,566	6,532	6,435
Hong Kong	1,641	1,735	1,363	1,542	1,207
Indonesia	927	989	969	1,164	926
Korea, Republic of	5,366	6,029	6,537	9,198	8,978
Malaysia	1,616	1,464	1,515	1,704	1,741
Taiwan	3,080	2,557	2,528	3,263	3,280
Thailand	2,553	2,793	2,572	3,350	3,593
Singapore	900	776	700	760	598
Other countries	1,686	2,000	2,287	2,826	2,335
Middle East	1,283	1,090	1,523	1,074	1,172
Europe	1,004	854	1,193	715	742
Americas:	4,313	4,000	3,808	3,097	2,340
Argentina	90	8	55	62	6
Brazil	34	41	31	44	33
Canada	443	499	244	315	231
Colombia	110	176	246	190	183
United States	2,803	2,137	2,206	1,485	1,076
Venezuela	30	52	57	38	7
Other countries	803	1,087	969	963	804
Africa	339	371	365	432	364
Oceania:	544	441	553	666	700
Australia	483	382	498	593	639
New Zealand	57	50	43	63	65
Other countries	4	9	12	10	6
Grand total	28,212	29,161	30,478	36,323	34,411

Source: The Japan Iron and Steel Federation, Monthly Report of the Iron and Steel Statistics, v. 47, no. 3, March 2004, p. 14-17.

TABLE 9
JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN THE 1990s, AN UPDATE IN 2003

	Australia		Canada, British Columbia	
	McArthur River, Northern Territory	Northparkes, New South Wales	Mount Polley ¹	Huckleberry
	Investment in exploration and development	Investment in exploration and development	Equity participation	Equity participation and provided loan.
Nature of project involvement	Investment in exploration and development	Investment in exploration and development	Equity participation	Equity participation and provided loan.
Participating Japanese companies and their equity share	Nippon Mining and Metals Co. Ltd., 15%; Mitsui and Co. Ltd., 5%; Mitsubishi Materials Corp., 5%; and Marubeni Corp., 5%	Sumitomo Metal Mining Oceania Pty., 13.3%; and SC Mineral Resources Ltd. of Australia, 6.7%	Sumitomo Corp., 0% ²	Mitsubishi Materials Corp., 31.25%; Dowa Mining Co. Ltd., 6.25%; Furukawa Co. Ltd., 6.25%; and Marubeni Corp., 6.25%.
Majority equity holder and/or other equity holder	Mount Isa Mines Ltd. of Australia, 70%	North Broken Hill Peko Ltd. of Australia, 80%	Imperial Metals Corp. of Canada, 100% ²	Princeton Mining Corp. of Canada, 50%.
Mineral commodity involved	Lead, silver, and zinc	Copper and gold	Copper and gold	Copper.
Estimated reserves and ore grade	40 million metric tons, 5.5% lead, 12.6% zinc, 55 grams per metric ton silver	63.7 million metric tons, 1.108% copper, 0.487 gram per metric ton gold	81.5 million metric tons, 0.3% copper, 0.42 gram per metric ton gold	56.5 million metric tons, 0.494% copper, 0.014% molybdenum.
Type of mine	Underground	Open pit and underground	Open pit	Open pit.
Total cost of the project	\$246 million (Australian)	\$303 million (Australian)	\$123 million (Canadian)	\$136 million (Canadian).
Japanese share	\$22 million (Australian)	\$75.6 million (Australian)	\$109 million (Canadian)	\$78 million (Canadian).
Annual production capacity	1,270,000 metric tons of crude ore containing 6.1% lead, 15.4% zinc	3,934,000 metric tons of crude ore containing 1.73% copper plus 0.88 gram per ton gold	6,500,000 metric tons of crude ore	7,145,600 metric tons of crude ore containing 0.502% copper, 0.013% molybdenum.
Annual shipment to Japan	3,284 metric tons of lead and 17,999 metric tons of zinc in mixed concentrate	27,985 metric tons of copper in concentrate	15,000 metric tons of copper in concentrate plus gold value	28,277 metric tons of copper in concentrate.
Construction started	August 1993	May 1993	September 1996	1996.
Production started or planned	September 1995	October 1995	June 1997	October 1997.
Chile				
Region III				
	Collahuasi, Region I	La Candelaria, Region III	El Bronce (Atacama Kozan)	Los Pelembres, Region IV
Nature of project involvement	Equity participation and provided loan	Investment in exploration and development	Investment in exploration and development	Equity participation.
Participating Japanese companies and their equity share	Mitsui and Co. Ltd., 6.9%; Mitsui Mining and Smelting Co. Ltd., 1.5%; and Nippon Mining and Metals Co., Ltd., 3.6%	Sumitomo Metal Mining Arizona Inc., 15%; and Sumitomo Corp., 5%	Nittetsu Mining Co. Ltd., 60%	Nippon Mining and Metals Co. Ltd., 15%; Mitsubishi Materials Corp., 10%; Marubeni Corp., 8.75%; Mitsubishi Corp., 5%; and Mitsui and Co. Ltd., 1.25%.
Major equity holder and/or other equity holder	Falconbridge Ltd. of Canada, 44%, and Anglo American plc of the United Kingdom, 44%	Phelps Dodge Corp. of the United States, 80%	Inversiones Errazuriz Ltda of Chile, 40%	Antofagasta plc of the United Kingdom, 55.55%, and Anaconda Chile S.A. of Chile, 9.45%.
Mineral commodity involved	Copper	Copper and gold	Copper	Copper.
Estimated reserves and ore grade	1,867.7 million metric tons, 0.93% copper	366 million metric tons, 0.84% copper, 0.205 gram per metric ton gold	20 million metric tons, 1.5% copper, 0.26 gram per metric ton gold	1,139.7 million metric tons, 0.74% copper.
Type of mine	Open pit	Open pit	Underground	Open pit.
Total cost of the project	\$1,760 million	\$592 million	\$110 million	\$1,355 million.
Japanese share	\$174 million	\$296 million	\$110 million	\$835 million.
Annual production capacity	25,600,000 metric tons of crude ore	10,000,000 metric tons of crude ore	1,650,000 metric tons of crude ore	34,000,000 metric tons of crude ore.
Annual shipment to Japan	94,591 metric tons of copper in concentrate	90,801 metric tons of copper in concentrate	15,000 metric tons of copper in concentrate	167,282 metric tons of copper in concentrate.
Construction started	1996	April 1993	April 2001	November 1997.
Production started or planned	January 1999	March 1995	January 2003	April 2000.

See footnotes at end of table.

TABLE 9--Continued

JAPAN: MAJOR OVERSEAS DEVELOPMENT PROJECTS OF NONFERROUS METALS MINES IN THE 1990s, AN UPDATE IN 2003

	Indonesia, Batu Hijau, Sumbawa Island	Mexico		Peru, Antamina, Ancash
		Tizapa, Mexico City	Rey de Plata, Guerrero	
Nature of project involvement	Equity participation	Investment in exploration and development	Investment in exploration and development	Investment in exploration and development.
Participating Japanese companies and their equity share	Sumitomo Corp., 26%; Sumitomo Metal Mining Co. Ltd., 5.0%; Mitsubishi Materials Corp., 2.5%; and Furukawa Co. Ltd., 1.5%	Dowa Mining Co. Ltd., 39%; and Sumitomo Corp., 10%	Dowa Mining Co. Ltd., 39%, and Sumitomo Corp., 10%	Mitsubishi Corp., 10%.
Majority equity holder and/or other equity holder	Newmont Gold Co. of the United States, 45%, and P.T. Pukuafu Indah of Indonesia, 20%	Industrias Penoles SA de C.V. of Mexico, 51%	Industrias Penoles SA de C.V. of Mexico, 51%	Noranda Inc. of Canada and Billiton plc of the United Kingdom, 33.75% each; and Teck Cominco Ltd. of Canada, 22.5%.
Mineral commodity involved	Copper and gold	Copper, lead, and zinc	Copper, lead, and zinc	Copper and zinc.
Estimated reserves and ore grade	907.3 million metric tons, 0.44% copper, 0.377 gram per metric ton gold	2.5 million metric tons, 0.61% copper, 1.36% lead, 6.56% zinc plus gold and silver	2.9 million metric tons, 0.68% copper, 2.56% lead, 8.78% zinc plus gold and silver	559 million metric tons, 1.23% copper, 1.03% zinc, and 0.03% molybdenum.
Type of mine	Open pit	Underground	Underground	Open pit.
Total cost of the project	\$1,925 million	\$38.2 million	\$45.4 million	\$2,296 million.
Japanese share	\$513 million	\$35.1 million	\$41.3 million	\$404 million.
Annual production capacity	43,870,000 metric tons of crude ore containing 0.75% copper and 0.44 grams per metric ton gold	480,000 metric tons of crude ore	330,000 metric tons of crude ore	25,600,000 metric tons of crude ore.
Annual shipment to Japan	101,492 metric tons of copper in concentrate	22,151 metric tons of zinc in concentrate	21,985 metric tons of zinc in concentrate	10,579 metric tons of copper in concentrate.
Construction started	September 1996	May 1992	January 1998	1998.
Production started or planned	October 1999	November 1994	October 2000	June 2001.

¹Mining operations at Mount Polley were suspended in September 2001 owing to continued low copper and gold prices.

²SC Minerals Canada Ltd. (a wholly owned subsidiary of Sumitomo Corp.) sold its 47.5% interest in Mount Polley Copper Project to Imperial Metals Corp. of Canada for \$4.5 million by the end of 2000.

Sources: Research Institute of Economy, Trade and Industry (Chosakai), Mining Handbook (Kogyo Benran), 2002, p. 210-217; Japan Mining Industry Association, Kozan, v. 56, no. 7, 2003, p. 10-15; Japan Oil, Gas and Metals National Corp., Atakama Kozan Project in Chile, August 2004.

TABLE 10
JAPAN: EXPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2001	2002	Destinations, 2002	
			United States	Other, principal
METALS				
Alkali and alkaline-earth metals	404	541	19	China 330; India 118; Hong Kong 28.
Aluminum:				
Ore and concentrate	660	400	--	All to Taiwan.
Oxides and hydroxides	278,154 ^r	295,896	2,815	Republic of Korea 187,292; Taiwan 35,314; Thailand 17,864.
Ash and residue containing aluminum	9,159	8,678	--	China 6,924; Taiwan 713; North Korea 594.
Metal including alloys:				
Scrap	52,674	55,363	72	China 48,498; Hong Kong 4,209; Philippines 1,095.
Unwrought	12,567	12,447	536	Republic of Korea 3,191; Indonesia 3,101; Philippines 1,576.
Antimony:				
Oxides	1,924	2,524	44	Thailand 379; Malaysia 347; Singapore 341.
Metal including alloys, all forms ²	162	471	2	China 201; Taiwan 100; Spain 76.
Arsenic, metal, including alloys, all forms	29	6	5	Mainly to United Kingdom.
Beryllium, metal, including alloys, all forms	4	2	--	China 1; Taiwan 1.
Bismuth, metal, including alloys, all forms ²	31	4	--	Malaysia 2. Taiwan 2.
Cadmium, metal including alloys, all forms	57	333	--	China 252; Hong Kong 60.
Chromium:				
Ore and concentrate	65	44	--	Republic of Korea 33; China 5; Indonesia 6.
Oxides and hydroxides	4,494 ^r	4,706	946	Republic of Korea 2,217; Taiwan 1,020; Indonesia 104.
Metal, including alloys, all forms	226	432	185	Republic of Korea 135; Taiwan 80.
Cobalt:				
Oxides and hydroxides	380	693	3	Republic of Korea 480; Taiwan 78; China 62.
Metal including alloys, all forms	1,342	1,149	137	Hong Kong 309; Canada 304; China 102.
Columbium and tantalum, tantalum metal, including alloys, all forms	348	277	123	United Kingdom 49; Germany 40; China 18.
Copper:				
Ore and concentrate	--	1	--	All to Thailand.
Oxides and hydroxides	1,736	2,223	12	Singapore 1,060; China 605; Republic of Korea 247.
Sulfate	2,922	2,932	45	Hong Kong 304; Republic of Korea 223; Singapore 163.
Metal, including alloys:				
Scrap	156,490	236,672	111	China 224,556; Hong Kong 6,203; Republic of Korea 2,603.
Unwrought	89,386 ^r	99,454	9,723	Republic of Korea 59,254; China 8,464; Taiwan 8,421.
Semimanufactures, all forms	270,247 ^r	285,442	18,028	China 45,166; Malaysia 39,678; Republic of Korea 32,086.
Germanium, metal, including alloys, all forms	226 ^r	503	60	Taiwan 310; China 110; Republic of Korea 17.
Gold:				
Waste and scrap	48	--	63	United Kingdom 200; Sweden 19; Philippines 15.
Metal, including alloys, unwrought and partly wrought	70	69	--	Singapore 21; Malaysia 18; Taiwan 17.
Iron and steel:				
Iron ore and concentrate	thousand tons 60 ^r	70	--	Mainly to China.
Metal:				
Scrap	do. 6,152 ^r	6,030	58	China 2,511; Republic of Korea 2,402; Taiwan 923.
Pig iron, cast iron, related materials	532	60,141	2,452	Republic of Korea 23,437; China 19,195; Taiwan 5,506.
Ferroalloys:				
Ferrochromium	2,686	1,362	1,035	Thailand 213; Republic of Korea 33.
Ferromanganese	28,018	14,855	4,395	Taiwan 4,669; Saudi Arabia 1,200; Republic of Korea 1,200.
Ferromolybdenum	21	34	3	Thailand 16; Malaysia 11; Republic of Korea 4.
Ferronickel	121,708	119,507	--	Taiwan 65,589; Republic of Korea 53,918.
Ferrosilicomanganese	431	478	16	Taiwan 270; Republic of Korea 156; Indonesia 36.
Ferrosilicon	4,287	5,592	23	Republic of Korea 2,219; Indonesia 1,111; Thailand 952.
Silicon metal	464	508	10	China 335; Republic of Korea 89; Taiwan 27.
Unspecified	3,449	2,407	1,472	China 209; Thailand 154.
Lead:				
Ore and concentrate	--	1	--	All to China.
Oxides	246	138	--	Taiwan 48; Republic of Korea 31; Singapore 20.
Ash and residue containing lead	12 ^r	66	(3)	Thailand 55; China 8; Republic of Korea 2.

See footnotes at end of table.

TABLE 10--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2001	2002	Destinations, 2002	
			United States	Other, principal
METALS--Continued				
Lead--Continued				
Metal, including alloys:				
Scrap	3,857	9,634	--	Republic of Korea 8,946; China 568; India 104.
Unwrought	6,729	23,002	--	China 9,499; Taiwan 3,847; Indonesia 3,418.
Semimanufactures	488	817	119	Taiwan 443; Hong Kong 76; Indonesia 74.
Lithium:				
Oxide and hydroxide	22	35	3	Taiwan 21; China 10.
Magnesium, metal, including alloys:				
Scrap	210	145	--	China 74; United Kingdom 71.
Unwrought	121	240	--	Republic of Korea 211; Taiwan 20.
Manganese:				
Ore and concentrate, battery-grade	2,922	--	--	
Oxides	22,758 ^r	26,246	2,118	Indonesia 6,441; China 6,011; Singapore 4,372.
Metal, including alloys, all forms	48	29	--	Republic of Korea 10; China 7; Taiwan 4.
Mercury	17	6	--	Indonesia 2; Iran 2.
Molybdenum:				
Ore and concentrate, roasted	--	177	--	Republic of Korea 52; India 17.
Oxides and hydroxides	35	33	2	Netherlands 18; India 5; Italy 3.
Metal, including alloys, all forms	172	188	21	Republic of Korea 82; Taiwan 28; Singapore 13.
Nickel:				
Matte and speiss	25,480	23,112	6	Republic of Korea 12,425; Taiwan 10,351. Belgium 328.
Oxides and hydroxides	3,077	4,428	582	Hong Kong 1,621; Taiwan 798; China 720.
Metal, including alloys:				
Scrap	712	308	90	United Kingdom 121; Hong Kong 59; Republic of Korea 14.
Unwrought	954	384	77	United Kingdom 97; Indonesia 57; Republic of Korea 32.
Semimanufactures	8,085	9,551	1455	Hong Kong 1,686; Republic of Korea 1,591; Kazakhstan 1,104.
Platinum-group metals:				
Waste and sweepings	3	--	--	
Metal, including alloys, unwrought and partly wrought:				
Palladium, value	thousands	\$1,708 ^r	\$811	\$237 Austria \$282; Republic of Korea \$85; China \$78.
Platinum, value	do.	\$1,388 ^r	\$882	\$67 Hong Kong \$460; Singapore \$55; Republic of Korea \$42.
Rhodium, value	do.	\$30 ^r	\$36	\$8 Germany \$9; Republic of Korea \$7; Thailand \$6.
Iridium, osmium, ruthenium, value	do.	\$26 ^r	\$33	(3) Malaysia \$13; Singapore \$12; Germany \$2.
Rare-earth metals, including alloys, all forms		197	177	4 China 158; Hong Kong 9; United Kingdom 3.
Selenium		605	572	4 China 236; Hong Kong 109; India 102.
Silicon		3,022	3,732	446 United Kingdom 956; Republic of Korea 622; Malaysia 607.
Silver, metal, including alloys, unwrought and partly wrought, value	thousands	\$877 ^r	\$952	\$57 Taiwan \$299; Republic of Korea \$47; Hong Kong \$39.
Tin, metals, including alloys:				
Scrap		567	601	18 United Arab Emirates 290; Belgium 231; Taiwan 57.
Unwrought		954	396	-- Malaysia 73; China 62; Taiwan 40.
Semimanufactures		1,705	2,683	90 Hong Kong 719; China 658; Taiwan 292.
Titanium:				
Ore and concentrate		60	24	-- All to Singapore.
Oxides		23,531	25,500	1,565 China 8,985; Taiwan 6,110; Republic of Korea 2,708.
Metal, including alloys, all forms		24,057	18,302	6,600 Taiwan 1,930; United Kingdom 1,921; Sweden 1,401.
Tungsten:				
Ore and concentrate		20	4	-- All to Malaysia.
Metal, including alloys, all forms		2,021	1,826	332 Germany 473; Taiwan 364; China 239.

See footnotes at end of table.

TABLE 10--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

			Destinations, 2002	
Commodity	2001	2002	United States	Other, principal
METALS--Continued				
Uranium and thorium, metals, including alloy, all forms	31	--	--	
Vanadium:				
Oxides and hydroxides	31	248	--	China 139; Netherlands 52; Taiwan 21.
Metal, including alloys, all forms	19	1	--	Mainly to Thailand.
Zinc:				
Ore and concentrate	--	5	--	All to China.
Oxides	2,277	2,345	498	Thailand 355; Turkey 343; China 246.
Blue powder	50	7	(3)	Mainly to Republic of Korea.
Ash and residue containing zinc	1,566	1,661	--	Republic of Korea 1,405; Taiwan 201; Indonesia 38.
Metal including alloys:				
Scrap	5,291	4,514	(3)	China 2,535; Hong Kong 1,033; Taiwan 908.
Unwrought	77,623	107,004	8,512	Taiwan 37,862; Vietnam 14,888; Philippines 12,151.
Semimanufactures	3,605	4,247	101	China 1,372; Indonesia 1,199; Singapore 361.
Zirconium:				
Ore and concentrate	56	302	19	Malaysia 130, China 51; Singapore 42.
Metal, including alloys, all forms	51	44	1	Republic of Korea 14; Canada 13; Taiwan 5.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural, corundum, emery, pumice, etc.	17,462	18,901	27	Republic of Korea 10,824; China 4,523; Taiwan 1,326.
Artificial:				
Corundum	22,054	19,867	3,618	Republic of Korea 4,501; Taiwan 2,737; China 1,748.
Silicon carbide	9,586	9,921	1,021	Taiwan 1,737; Malaysia 978; Thailand 533.
Dust and powder of precious and semiprecious stones, including diamond, value	thousands \$2 ^r	\$1	(3)	
Grinding and polishing wheels and stones	9,769	9,279	1,250	Indonesia 1,592; Republic of Korea 944; Mexico 747.
Asbestos, crude	54	29	--	India 18; Hong Kong 10; Malaysia 1.
Barite and witherite	2	2	--	All to Indonesia.
Boron materials, oxides and acids	206	496	--	Taiwan 266; Hong Kong 87; Malaysia 65.
Cement	thousand tons 7,576	8,136	(3)	China 1,931; Hong Kong 1,839; Singapore 1,615.
Chalk	1,251	2,081	--	Republic of Korea 1,476; Taiwan 587; Thailand 18.
Clays, crude:				
Bentonite	1,621	1,801	61	Indonesia 700; China 208; Thailand 425.
Chamotte or dinas earth	96	58	--	Republic of Korea 36; Indonesia 22.
Fire clay	3,033	2,554	--	Taiwan 1,013; Republic of Korea 726; Thailand 447.
Kaolin	5,490	11,182	71	Republic of Korea 6,374; China 1,913; Taiwan 1,481.
Unspecified	20,644	18,484	211	Indonesia 5,479; Taiwan 2,392; China 1,999.
Diamond, natural:				
Gem, not set or strung	carats 223,656 ^r	122,128	858	Singapore 80; Hong Kong 6; Belgium 3.
Industrial stones	thousand carats 2,221	3,299	675	Republic of Korea 1,103; Philippines 603; Germany 296.
Dust and powder	do. 18,078 ^r	10,180	4,601	Republic of Korea 2,101; Thailand 866; Philippines 663.
Diatomite and other infusorial earth	2,496	2,258	--	Taiwan 1,117; Vietnam 440; Netherlands 139.
Feldspar	3,242	4,204	--	Taiwan 3,043; Thailand 817; Hong Kong 259.
Fluorspar	129	578	--	Singapore 440; Thailand 96.
Fertilizer materials:				
Crude, n.e.s.	1,834	5,448	2	China 3,287; Taiwan 907; Republic of Korea 810.
Manufactured:				
Ammonia	3,118	4,217	430	Taiwan 1,845; Singapore 671; Malaysia 580.
Phosphatic	113	7,957	--	Indonesia 5,000; Taiwan 2,870.
Potassic	476	377	248	Republic of Korea 63; Taiwan 38; Indonesia 18.
Unspecified and mixed	892,332	888,526	10,827	Malaysia 285,700; Vietnam 256,358; Philippines 176,973.
Graphite, natural	1,762	1,422	451	Republic of Korea 208; China 145; Germany 129.
Gypsum and plaster	4,548	3,934	27	Republic of Korea 971; Bangladesh 787; Hong Kong 661.
Iodine	5,440	5,350	1,864	France 618; Italy 536; United Kingdom 468.

See footnotes at end of table.

TABLE 10--Continued
JAPAN: EXPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

		Destinations, 2002			
Commodity		2001	2002	United States	Other, principal
INDUSTRIAL MINERALS--Continued					
Kyanite and related materials, mullite and unspecified		2,876	2,929	4	Republic of Korea 2,107; Taiwan 328; China 159.
Lime		4,210	3,979	192	Republic of Korea 1,805; Taiwan 1,029; Malaysia 357.
Magnesium compounds:					
Magnesite, crude		38	51	--	Taiwan 23; Argentina 20; Australia 8.
Oxides and hydroxides		13,806	15,885	5,204	Republic of Korea 1,855; Germany 1,321; Taiwan 1,147.
Mica:					
Crude including splittings and waste		1,133	1,215	249	Thailand 251; Republic of Korea 245; Indonesia 172.
Worked including agglomerated splittings		1,246	1,650	13	China 658; Austria 641; Costa Rica 85.
Nitrates, crude		290	222	--	Thailand 113; Malaysia 15.
Phosphates, crude		--	14	4	All to Malaysia.
Phosphorus, elemental		22	63	4	Taiwan 33; Republic of Korea 22.
Pigments, mineral, iron oxides and hydroxides, processed		37,595	50,390	5,376	Republic of Korea 11,269; China 16,430; Thailand 7,877.
Precious and semiprecious stones other than diamond:					
Natural, value	thousands	\$1 ^r	\$3	(3)	Hong Kong \$1.
Synthetic, value		\$318 ^r	\$325	\$77	China \$33; Malaysia \$19; Thailand \$15.
Pyrite, unroasted		25	10	--	All to Republic of Korea.
Quartz crystal, piezoelectric		kilograms 50,421	55,374	1,335	Thailand 16,808; Philippines 15,284; Malaysia 7,689.
Salt and brine		1,250	1,926	42	Republic of Korea 1,136; Thailand 247; Russia 159.
Slag and dross, not metal-bearing		2,851	5,888	286	Taiwan 2,521; Republic of Korea 876; United Arab Emirates 298.
		thousand tons			
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked		18,261 ^r	27,004	10	China 26,513; Taiwan 121; Republic of Korea 85.
Worked, value	thousands	\$22 ^r	\$14	\$2	China \$3; Hong Kong \$1; Republic of Korea \$1.
Dolomite, chiefly refractory-grade		273	258	29	Taiwan 140; Malaysia 59; Republic of Korea 30.
Gravel and crushed rock		3,853 ^r	4,371	--	Republic of Korea 3,395; Taiwan 782; Thailand 138.
Limestone other than dimension		thousand tons 2,673	2,003	--	Taiwan 1,174; Australia 563; Republic of Korea 246.
Quartz and quartzite		1,249	2,239	28	Republic of Korea 1,569; United Kingdom 258; Singapore 160.
Sand other than metal-bearing and sand and gravel		9,512	8,119	57	Taiwan 3,205; Indonesia 1,596; China 991.
Sulfur:					
Elemental:					
Crude including native and byproduct	thousand tons	1,218	1,095	59	China 674; Republic of Korea 146; India 107.
Colloidal, precipitated, sublimed		308	949	499	China 133; Republic of Korea 97; Taiwan 70.
Dioxide		12	20	--	Republic of Korea 17; Taiwan 3.
Sulfuric acid	thousand tons	1,248,491 ^r	1,592,787	27,050	China 768,958; Chile 288,764; Taiwan 152,251.
Talc, steatite, soapstone, pyrophyllite		11,640	6,615	326	Singapore 992; Republic of Korea 905; China 809.
Vermiculite, perlite, chlorite		18,006	23,370	36	Republic of Korea 20,763; Taiwan 2,256; Malaysia 188.

^rRevised. -- Zero.

¹Data presented in this table are from Japan Exports and Imports Commodity by Country, 2001 and 2002. Table prepared by Regina Coleman, International Data Unit.

²Includes waste and scrap.

TABLE 11
JAPAN: IMPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

				Sources, 2002	
Commodity		2001	2002	United States	Other, principal
METALS					
Alkali and alkaline-earth metals		288	13,440	3,402	China 8,280; Russia 1,020; France 218.
Aluminum:					
Ore and concentrate		2,050,567 ^r	1,872,834	--	Australia 1,029,115; Indonesia 732,184; India 64,953.
Oxides and hydroxides		88,519	84,920	5,409	Australia 65,286; China 6,894; Germany 3,351.
Ash and residue		1,331	514	--	Russia 233; Republic of Korea 101; China 80.
Metal including alloys:					
Scrap		120,829	133,374	37,004	Australia 13,194; United Kingdom 9,399; Saudi Arabia 7,956.
Unwrought thousand tons		2,611	2,575	5	Russia 680; New Zealand 197; Brazil 191.
Antimony:					
Ore and concentrate		20	21	--	China 20; Austria 1.
Oxides		7,382	7,112	52	China 6,215; Taiwan 580; Mexico 182.
Metal including alloys, all forms		7,372	6,920	--	China 6,900; Thailand 19.
Arsenic, metal including alloys, all forms		220,621 ^r	226,507	6,347	China 161,015; Norway 14,927; Australia 14,195.
Beryllium, metal including alloys, all forms		13	9	(2)	Mainly from China.
Bismuth, metal including alloys, all forms		241	474	100	China 229; Peru 146; Belgium 76.
Cadmium, metal including alloys, all forms		2,723	3,002	(2)	Republic of Korea 1,185; Canada 503; Peru 286.
Chromium:					
Ore and concentrate		411,120	354,928	--	South Africa 189,132; India 144,120; Iran 10,999.
Oxides and hydroxides		4,970	3,797	353	China 1,622; Kazakhstan 1,240.
Metal including alloys, all forms		3,480	2,922	555	China 1,262; United Kingdom 283; France 514.
Cobalt:					
Ore and concentrate		--	20	--	Australia 10; Netherlands 10.
Oxides and hydroxides		1,484 ^r	2,505	93	Belgium 1,768; Finland 568.
Metal including alloys, all forms		7,973	9,827	152	Canada 2,032; Finland 1,977; Australia 1,781.
Columbium and tantalum, tantalum metal including alloys, all forms		251	132	33	Thailand 38; China 31; Germany 6.
Copper:					
Ore and concentrate thousand tons		4,112	4,249	--	Chile 1,527; Indonesia 1,015; Papua New Guinea 374.
Matte including cement copper		1,956	1,651	--	Vietnam 708; Taiwan 360; Malaysia 331.
Oxides and hydroxides		3,732	2,787	1,708	Malaysia 474; Vietnam 158; Republic of Korea 140.
Sulfate		741	674	4	Taiwan 240; China 206; Thailand 150.
Ash and residue containing copper		4,020	2,448	343	Malaysia 1,386; Republic of Korea 325; Philippines 150.
Metal including alloys:					
Scrap		142,702	125,709	28,037	Philippines 20,437; Singapore 20,034; Malaysia 13,538.
Unwrought		167,242	127,387	645	Peru 3,494; Indonesia 3,100; Chile 2,994.
Semimanufactures		58,738	60,091	1,944	Republic of Korea 20,224; Malaysia 12,568; Taiwan 5,898.
Germanium, metal including alloys, all forms		7	1	--	Mainly from China.
Gold:					
Waste and sweepings		238	--	--	NA.
Metal including alloys, unwrought and partly wrought kilograms		43,231	84,706	3,724	Australia 37,913; Switzerland 12,077; Uzbekistan 6,667.
Iron and steel:					
Iron ore and concentrate excluding roasted pyrite thousand tons		126,297 ^r	129,088	--	Australia 74,280; Brazil 25,019; India 15,504.
Metal:					
Scrap do.		151,030 ^r	178,623	7,520	Republic of Korea 56,332; Taiwan 42,156; Russia 16,459.
Pig iron, cast iron, related materials do.		318,772 ^r	267,379	1,099	China 83,103; Brazil 55,335; North Korea 36,558.
Ferroalloys:					
Ferrochromium		739,687	783,371	(2)	South Africa 442,167; Kazakhstan 139,510; China 29,777.
Ferromanganese		54,549	58,053	--	China 32,484; South Africa 17,015; Republic of Korea 4,359.
Ferromolybdenum		3,873	3,993	--	China 3,773; Chile 220.
Ferronickel		45,470	50,058	(2)	New Caledonia 31,925; Indonesia 6,668; Dominica 5,770.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2001	2002	Sources, 2002	
			United States	Other, principal
METALS--Continued				
Iron and steel--Continued:				
Metal--Continued:				
Ferroalloys--Continued:				
Ferrosilicochromium	3,493	2,812	--	China 2,750; Zimbabwe 62.
Ferrosilicomanganese	218,405	254,269	--	China 200,552; Australia 22,061; Ukraine 15,906.
Ferrosilicon	472,840	463,304	2	Russia 95,044; Brazil 49,550; Ukraine 8,668.
Ferrotungsten	826	546	--	All from China.
Silicon metal	184,771	189,723	120	China 154,287; Norway 14,914; Australia 14,182.
Unspecified	33,787	34,351	10	France 17,407; Brazil 11,780; China 11,329.
Lead:				
Ore and concentrate	186,136	155,109	65,871	Australia 55,400; Peru 13,495; Bolivia 6,496.
Oxides	37,301	26,244	57	China 15,657; Taiwan 6,194; Malaysia 1,160.
Metal including alloys:				
Unwrought	45,208	17,223	2	China 15,261; Peru 797; Mexico 470.
Semimanufactures	2,397	2,293	3	China 1,278; France 687; United Kingdom 160.
Lithium, oxides and hydroxides	1,312	1,019	699	China 228; Russia 57; Taiwan 35.
Magnesium, metal including alloys:				
Scrap	790	1,065	1	Taiwan 836; Republic of Korea 207; China 20.
Unwrought	33,665	35,106	32	China 28,887; Norway 3,218; Canada 2,359.
Semimanufactures	3,350	5,326	212	China 4,780; Russia 207.
Manganese:				
Oxides and dioxides	2,155	2,598	(2)	China 1,583; Belgium 626; South Africa 200.
Metal including alloys, all forms	52,748	45,779	1,077	China 37,033; South Africa 7,400; Costa Rica 180.
Mercury	11	7	(2)	Mainly from Algeria.
Molybdenum:				
Ore and concentrate:				
Roasted	31,687	30,140	1,088	Chile 13,259; Mexico 4,600; Canada 3,990.
Unroasted	60	50	--	Austria 30; China 20.
Oxides and hydroxides	1,492	1,166	267	Chile 513; China 327; Taiwan 18.
Metal including alloys, semimanufactures, all forms				
	882	630	70	Austria 207; China 203; Uzbekistan 22.
Nickel:				
Ore and concentrate	4,419,916 ^r	4,507,335	--	Mainly from Indonesia.
Matte	117,349	101,450	--	Indonesia 75,267; Australia 26,182.
Oxides and hydroxides	60	106	12	Canada 67; Finland 27.
Metal including alloys:				
Scrap	16,040	14,033	2,553	Russia 3,266; Zimbabwe 2,466; Republic of Korea 1,001.
Unwrought	28,762	41,299	15	Australia 11,234; Russia 8,155; Norway 4,064.
Semimanufactures	11,289	12,123	1,032	Canada 4,769; United Kingdom 4,465; Russia 855.
Platinum-group metals:				
Waste and sweepings	339	--	--	NA.
Metal including alloys, unwrought and partly wrought:				
Palladium, value thousands	\$10,046 ^r	\$5,163	\$621	Russia \$1,311; Germany \$412; Netherlands \$50.
Platinum thousand grams	53,031 ^r	53,807	2,888	South Africa 39,733; Germany 3,949; United Kingdom 2209.
Rhodium do.	4,759 ^r	6,081	615	South Africa 4,588; United Kingdom 396; Hong Kong 54.
Iridium, osmium, ruthenium do.	6,991 ^r	8,015	570	South Africa 6,507; Germany 396; United Kingdom 270.
Rare-earth metals including alloys, all forms	3,346	4,985	17	China 4,947; Estonia 18; Belgium 2.
Selenium	18	26	--	Philippines 19; Belgium 5; United Kingdom 2.
Silicon, high-purity	6,271	6,052	3,723	Germany 852; United Kingdom 798; China 344.
Silver:				
Ore and concentrate	14,813	10,149	--	Peru 8,156; Chile 1,993.
Metal including alloys, unwrought and partly wrought				
	1,388 ^r	1,469	342	Mexico 315; Republic of Korea 258; Peru 192.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

			Sources, 2002		
Commodity	2001	2002	United States	Other, principal	
METALS--Continued					
Tin, metal including alloys:					
Ore and concentrate	14	--	--	NA.	
Metal including alloys:					
Scrap	36	88	--	Republic of Korea 46; China 23; Thailand 14.	
Unwrought	24,144	26,519	17	Indonesia 11,893; China 9,858; Thailand 2,856.	
Semimanufactures	369	625	6	Thailand 363; Singapore 189; Republic of Korea 25.	
Titanium:					
Ore and concentrate	112,802	385,223	40	Vietnam 116,487; Australia 152,443; India 34,390.	
Oxides	14,298	9,106	235	China 5,580; Republic of Korea 2,053; France 601.	
Metal including alloys, all forms	10,333	11,074	2,844	Russia 3,910; Kazakhstan 3,420; Ukraine 460.	
Tungsten:					
Ore and concentrate	951	887	--	Russia 787; Portugal 80; Netherlands 20.	
Metal including alloys, all forms	1,418	1,057	46	China 642; Germany 97; Taiwan 47.	
Uranium and thorium, metal including alloys, all forms	767	20	--	All from Vietnam.	
Vanadium, metal including alloys, all forms					
Oxides and hydroxides	3,638	3,981	(2)	Australia 1,080; South Africa 1,012.	
Ash and residue containing zinc	127	--	--	NA.	
Metal including alloys, all forms	230	217	147	Mainly from Germany.	
Zinc:					
Ore and concentrate	thousand tons	1,164	1,008	144	Australia 359; Peru 193; Canada 86.
Oxides		13,874	15,680	230	China 6,939; Republic of Korea 5,902; Taiwan 1,332.
Blue powder		1,532	973	(2)	Singapore 473; Republic of Korea 256; China 144.
Ash and residue containing zinc		31,165	19,952	2,575	Taiwan 8,631; Republic of Korea 6,922; Philippines 1,038.
Metal including alloys:					
Scrap		31	45	--	Republic of Korea 29; Philippines 16.
Unwrought		63,580	23,112	(2)	Peru 11,271; China 8,349; Canada 2,412.
Semimanufactures		4,130	5,979	51	China 3,111; Belgium 1,055; Republic of Korea 367.
Zirconium:					
Ore and concentrate		84,124	74,757	1,660	Australia 45,345; South Africa 25,405; Russia 2,170.
Metal including alloys, all forms		557	580	348	France 219; Sweden 2; United Kingdom 2.
INDUSTRIAL MINERALS					
Abrasives, n.e.s.:					
Natural, corundum, emery, pumice, etc.		17,056	22,036	3,180	India 9,864; China 7,037; Republic of Korea 327.
Artificial:					
Corundum		162,405	143,877	432	China 126,168; Austria 5,219; Australia 5,032.
Silicon carbide		68,519	57,831	34	China 53,055; Brazil 2,165; Norway 951.
Dust and powder of precious and semiprecious stones					
including diamonds, value	thousands	\$9 ^r	\$21	\$18	Mainly from China.
Grinding and polishing wheels and stones		5,200	5,563	155	China 3,293; Thailand 1,373; Taiwan 134.
Asbestos, crude		79,463	43,390	2,154	Canada 24,430; Zimbabwe 11,265; Brazil 2,974.
Barite and witherite		94,272	79,959	310	China 75,176; North Korea 4,297; Thailand 176.
Boron:					
Crude natural borates		44,679	34,480	20	Turkey 29,930; Russia 4,530.
Oxides and acids		555	427	391	Russia 36.
Cement		1,183,529 ^r	824,029	222	Republic of Korea 798,802; France 12,393; China 10,981.
Clays, crude:					
Bentonite		200,022	208,798	133,901	China 37,937; Canada 35,218; New Zealand 786.
Chamotte or dinas earth		15,388	6,892	--	China 3,011; South Africa 1,944; Republic of Korea 1,749.
Fire clay		9,989	5,786	1,720	China 4,064; Brazil 2.
Fuller's earth		9,140	10,075	6,293	China 3,348; Australia 434.
Kaolin		1,381 ^r	1,286	895	Brazil 231; Indonesia 55; China 53.
Unspecified		152,695	159,855	2,363	China 156,024; Czech Republic 601.
Cryolite and chiolite		53	--	--	NA.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

			Sources, 2002	
Commodity	2001	2002	United States	Other, principal
INDUSTRIAL MINERALS--Continued				
Diamond, natural:				
Gem, not set or strung carats	31,651 ^r	22,750	4,610	United Kingdom 7,447; Israel 4,734; Belgium 2,412.
Industrial stones thousand carats	1,534	3,344	118	Ireland 3,121; United Kingdom 36; Belgium 34.
Dust and powder do.	92,436	99,575	17,455	Ireland 31,739; Ukraine 4,660; Republic of Korea 4,438.
Diatomite and other infusorial earth	7,427	6,889	5,117	China 1,730; Netherlands 23; Germany 10.
Feldspar	1,366	2,049	--	Malaysia 916; India 636; China 477.
Fluorspar	519,221	397,039	--	China 358,864; Mexico 23,131; Thailand 7,000.
Fertilizer materials:				
Crude, n.e.s.	57,635	33,712	6	China 14,474; Indonesia 13,758; Canada 473.
Manufactured:				
Ammonia	20,505	85,886	1,230	Taiwan 57,456; Singapore 27,200.
Phosphatic	139,713	161,697	47,868	China 102,025; Republic of Korea 9,199; Israel 2,500.
Potassic	930,053 ^r	952,986	292,544	Canada 334,732; Russia 98,281; Germany 64,677.
Unspecified and mixed	1,999,129 ^r	2,153,422	768,372	Canada 334,732; Jordan 263,979; China 149,396.
Graphite, natural	143,540	105,074	266	China 101,098; Sri Lanka 1,657.
Gypsum and plaster	1,983,225	1,922,296	405	Australia 940,118; Thailand 734,760; Mexico 242,535.
Iodine	273	375	1	Mainly from Chile.
Lime	17,675	9,861	--	Thailand 8,000; China 1,799.
Magnesium compounds:				
Magnesite, crude	1,870	2,524	--	North Korea 1,378; China 1,026.
Oxides and hydroxides	26,689	17,956	209	China 9,264; Israel 4,426; Republic of Korea 1,722.
Other	476	636	--	All from China.
Mica:				
Crude including splittings and waste	47,902	47,488	340	China 32,343; India 6,028; Canada 2,844.
Worked including agglomerated splittings	236	186	8	Belgium 78; China 31; Switzerland 22.
Nitrates, crude	22,024	11,368	--	Chile 11,200; China 100.
Phosphates, crude	770,645 ^r	844,527	21,854	China 365,348; South Africa 222,248; Morocco 102,877.
Phosphorus	26,541	28,213	38	China 27,610; Netherlands 498; Germany 62.
Pigments, mineral:				
Natural crude	252	--	--	NA.
Iron oxides and hydroxides, processed	54,460	21,842	1,840	China 11,311; Germany 5,512; Republic of Korea 1,779.
Potassium salts	72	--	--	NA.
Precious and semiprecious stones, other than diamond:				
Natural	672	1,148	14	Brazil 581; China 295; South Africa 162.
Synthetic kilograms	50,706	40,138	10,724	China 13,746; Austria 5,645; Republic of Korea 3,522.
Pyrite, unroasted	9,773	7,109	--	Mainly from China.
Quartz crystal, piezoelectric kilograms	150,588	62,206	14,259	Brazil 20,000; Malaysia 9,725; China 8,325.
Salt and brine thousand tons	7,866	7,428	2	Mexico 3,637; Australia 3,102; India 392.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked do.	268	161	1	China 35; India 24; South Africa 20.
Worked do.	1,542	1,583	3	China 1,437; Italy 41; Spain 15.
Dolomite, chiefly refractory-grade	273	258	29	Taiwan 140; Malaysia 59.
Gravel and crushed rock	11,044 ^r	16,703	3,532	Guam 4,701; Republic of Korea 3,411; Taiwan 889.
Limestone other than dimension thousand tons	2,673	2,003	--	Taiwan 1,174; Australia 563; Republic of Korea 246.
Quartz and quartzite	108,538	122,503	2,797	Republic of Korea 50,977; India 39,066; China 21,357.
Sand other than metal-bearing and sand and gravel thousand tons	7,273	6,028	2	China 4,131; Australia 1,410; Taiwan 290.
Sulfur:				
Elemental:				
Crude including native and byproduct	488	888	--	China 568; Republic of Korea 320.
Colloidal, precipitated, sublimed	1,198	1,245	--	Republic of Korea 1,178; France 62.
Sulfuric acid	2	8,316	1	Republic of Korea 8,314; Taiwan 1.

See footnotes at end of table.

TABLE 11--Continued
JAPAN: IMPORTS OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2001	2002	Sources, 2002	
			United States	Other, principal
INDUSTRIAL MINERALS--Continued				
Talc, steatite, soapstone, pyrophyllite	362,623	322,592	2,676	China 270,134; Australia 46,310.
Vermiculite, perlite, chlorite	193,303	192,013	729	China 175,072; South Africa 13,330.
Other, slag and dross, not metal-bearing	778,149	706,802	34,690	Republic of Korea 210,794; Taiwan 185,753.

NA Not Available. ¹Revised. --Zero.

¹Data presented in this table are from Japan Exports and Imports Commodity by Country, 2001 and 2002. Table prepared by Regina Coleman, International Data Unit.

²Less than 1/2 unit.